COMPANY PROFILE

Automatski is a full stack quantum computing vendor, it makes all the hardware, software, frameworks and offers quantum systems on a subscription over the cloud. It makes quantum annealers and gate based quantum computers. But unlike annealers from other vendors which offer 5000 or 8000 qubits, Automatski starts with 5000 qubits and has been benchmarked at 100 million qubits. Automatski is working closely with semiconductor companies which need extreme scale annealers. So by the end of 2027 or early 2028 Automatski will push its annealers to 10 billion qubits. And its annealers are fully connected. Automatski's gate based quantum computers go upto hundreds of logical qubits and are the most powerful in the world.

Automatski offers 2 SDKs for its annealers and quantum computers. The SDKs have bindings in 25 different programming languages unlike other vendors which usually support only python. They also include support for dozens of top quantum frameworks and contain 100's of examples. So you can implement quantum algorithms using any of those frameworks like Google Cirq, Dwave, Amazon Braket, IBM Qiskit etc. or you can implement natively without using any frameworks. And execute them over Automatski's backend quantum systems.

Automatski hence has native support for Quantum + AI + HPC hybrid workflows and plays very well alongside AI and Supercomputing applications. Automatski also works on Quantum AI, Quantum Chemistry/Materials, Quantum Finance, Drug Discovery, and Quantum Cryptography applications. In Quantum AI it has implemented Quantum Neural Networks in Pytorch, and in Quantum Machine Learning it has implemented a SciKit-Learn kind of package which can be used to transparently run Machine Learning applications over its quantum computers. Quantum Chemistry and Materials are a low hanging fruit which can be solved with 100-300 Qubits.

Automatski has also implemented various cryptographic applications like RSA Factorization using Shors, AES S-Box, factorization using Annealers, Discrete Logarithms, Oded Regevs Algorithm. It holds the world record for the largest RSA number factorized and ECC bit strength cracked using Shors algorithm on quantum computers. It successfully ran problems with 126 logical qubits, which verifies the accuracy of its systems. It is in the process of scaling its systems further.

Automatski has existed for 2+ decades as multiple legal entities in EU and India. And is completely owned by Resident Indian Citizens. It is completely bootstrapped and has not raised and will not raise any funding in its core company. Though it will raise funding for its Quantum AI and Quantum Cryptography Ventures. It is head quartered in Bengaluru, India. And also plans to offer consulting to its global clientele.

Automatski collaborates with many universities for research. And owns The Millennium Institute which is into Quantum Computing Education & Training.

Let us know how can Automatski help you. info@automatski.com https://automatski.com

Appendix A – Offerings, Breakthroughs & Achievements

Quantum Computing & Quantum Annealing SDKs ** FREE

Automatski has two primary quantum SDKs

1. Initium for quantum annealers for solving optimization problems.
2. Komenco for quantum computers for running quantum circuits on gate based quantum computers.

Both the SDKs have bindings in 25 programming languages like C#, F#, Php, Python, Go, Julia, Rust, C++ etc. So its very easy to make web apps, mobile apps and even QUANTUM + AI + HPC workflows.

The python folder has the most advanced features in both the SDKs. It has integrations with quantum programming frameworks from all the top vendors.

Komenco SDK

Full Integration

1. Rigetti Pyquil
2. Quantinuum Ptket
3. IBM Qiskit
4. QIBO
5. Pennylane
6. Eclipse Qrisp
7. Qlasskit
8. Blueqat
9. Google Cirq
10. QPanda3 (Chinese)
11. Qoro-Divi
12. OpenQARP

Partial Integration

13. Amazon Braket
14. Classiq
15. Myqlm

Initium SDK

Full Integration

1. Dwave
2. PyQubo
3. Qubovert
4. Autoqubo

5. Myqlm
6. Qlasskit

You can program using any of the above frameworks and execute the problems on Automatski's systems.

Both the SDKs are preconfigured to use our entry level cloud based systems which are available 24x7 without any paywalls, signups, CC, or need for subscriptions and will work out of the box. Users can try out 100's of examples in the SDKs rightaway.

Initium (Optimization) SDK V1.0

Getting Started With The Quantum Optimization SDK Video

Komenco Quantum Computing SDK V1.0

Getting Started With The Quantum Circuit Programming SDK Video

Quantum Simulators

N/A Stopped Since 2020.

We use cuQuantum and Tensor Network simulators internally inside the company for development and testing. But we are not in the business of selling Quantum Simulators.

EDIT: We have recently developed Optimus.

Gate Based Quantum Computers (** Classified)

Automatski's quantum computers support 100's of logical qubits today. And we are increasing the capacity everyday limited only by funds and not technology. These are the most powerful quantum computers available in the world today.

Qudit Based Quantum Computers (** Classified)

Instead of using Qubits with two energy levels |0> and |1> our quantum computers can run quantum algorithms with Qudits with 'N' Energy Levels |0>, |1>,……, |N-1> this delivers huge benefits in solving problems faster and more efficiently.

Annealers – For Solving Optimization Problems (** Classified)

Automatski's annealers support upto 500 million qubits or binary/spin variables. They are the fastest, deliver best quality solution and the largest annealers available in the world today. They can be used to solve production grade problems today. It took a few seconds to solve a sparse 100 million qubit problem in tests.

Aurora – Continuous Variable Quantum Computing (** Classified)

Continuous Variable Quantum Computing (CVQC) is a quantum computing paradigm that processes information using the continuous physical properties of quantum fields, such as the amplitude and phase of light, rather than discrete qubits. Instead of utilizing binary states (0 and 1), CVQC relies on qumodes, which exist in an infinite-dimensional Hilbert space. This approach leverages established, scalable technologies like optical networks and lasers that can operate at room temperature. It holds strong potential for scaling up quantum processors and efficiently solving complex, continuous simulations in physics and chemistry.

Aurora integrates into Strawberry Fields as a backend to deliver CVQC.

Othello – Measurement Based Quantum Computing (**Classified)

Measurement-based quantum computing (MBQC), or one-way quantum computing) replaces traditional logic gates with a sequence of local, single-qubit measurements performed on a large, pre-existing entangled state known as a cluster state or graph state.

As each qubit is measured, it destroys part of the resource state while processing and propagating the quantum information forward.

A classical computer dynamically adjusts the measurement bases for remaining qubits based on prior measurement outcomes to keep the calculation on track.

This paradigm is fully equivalent in power to the standard gate-model approach, and it is especially useful for photonic quantum systems and blind quantum computing.

Othello integrates into Graphix as a backend to deliver MBQC. Graphix can also use Automatski's Gate Based Quantum Computers as a backend to execute MBQC Algorithms via Graphix.

Adiabatique (** Classified)

Adiabatic Quantum Computing is one of the many forms of Universal Quantum Computing besides Gate Based Quantum Computing. We have created a framework to solve universal quantum computing problems using adiabatic methods.

Quantum Playground ** FREE

A visual drag drop quantum circuit designer with a built in simulator. Which runs locally on the laptop. No credit cards, no login, no authorization, no subscriptions.

Microsoft Store

Windows Installer

Ubuntu Installer

Mac (M1-M5) Installer

Curiosity – AI Coding Agent ** FREE

A terminal based AI Coding Agent. Just install and run from the command line. Which runs locally on the laptop. No credit cards, no login, no authorization, no subscriptions.

Microsoft Store

Windows Installer

Steward – Agentic AI Quantum Computing Expert

Steward knows everything about Automatski's quantum annealers and quantum computers. Just tell it the problem you want solved in English and attach any data files. It will do everything, use Automatski's systems automatically and give you the answers/solutions.

Windows Installer

Quantum AI

Automatski has two offerings

1. Quantum Neural Networks
2. Quantum Machine Learning

We support development of Quantum AI models in

1. Pennylane
2. Qiskit Quantum Machine Learning
3. sQULearn
4. Torch Quantum (** Broken right now)

All such models can be executed on Automatski's Quantum Computers.

Quantum + AI + HPC

Covalent is an open-source workflow orchestration platform created by Agnostiq that allows developers to build workflows spanning:

1. AI/ML models
2. HPC clusters
3. GPUs
4. Quantum computers
5. Cloud resources
6. On-prem infrastructure

using a single Python-based programming model. Its primary purpose is to orchestrate heterogeneous computing resources rather than provide AI, HPC, or quantum algorithms itself.

Automatski's Quantum Annealers and Quantum Computers are fully integrated into Covalent to enable Quantum + AI + HPC workflows/use-cases today.

Quantum Centric Supercomputing

Planned!

Solutions that combine Quantum Computing and Supercomputers. Stalled because we don't have Supercomputers to develop use cases for demonstration.

Quantum Circuit Cutting

Automatski has implemented the worlds most advanced quantum circuit cutting framework that can run on HPC.

1. Qubit cutting
2. Qubit–qutrit cutting
3. Qutrit cutting
4. Ququart cutting
5. Heterogeneous multi-cut circuit

Elenktis – Quantum Computing Hardware Design

Elenktis solves problems like

1. pulse design
2. gate synthesis
3. error suppression
4. control sequence optimization

We can help the world design production grade quantum computers.

QEC Suite – Quantum Error Correction Breakthrough

There are three distinct problems in quantum error correction:

1. Discovering new quantum codes
2. Optimizing existing code structures
3. ~~Decoding errors in real time (N/A)~~

Quantum annealers can solve #1 and #2, while #3 is currently dominated by classical AI and specialized hardware/asic's/fpga's and requires realtime/wirespeed computations.

We have also built the following workflows into the QEC Suite:

1. Evaluate a code end to end
2. Discover and optimize with an annealer
3. Simulate modular QLDPC circuits
4. Benchmark research hypotheses
5. Co-design codes and hardware mappings with an annealer

We can help the world design production grade quantum computers.

Descifrador – Realtime Quantum Decoder

Descifrador is a realtime quantum decoder which has been tested on quantum circuits with 1000's of logical qubits and millions of gates with little or no stretch time. It contains the following types of QEC Decoders.

1. CPU Based
2. GPU Based
3. Neural Decoders

Aisthitiras – Quantum Sensors Design Suite

Aisthitiras is a closed-loop quantum sensor co-design suite, where a quantum computer is used to simulate, optimize, and validate the sensor before hardware fabrication. To optimize:

1. Probe quantum states
2. Sensor materials
3. Control pulse sequences
4. Noise robustness
5. Measurement protocols
6. Hardware architecture

rather than relying entirely on expensive laboratory experimentation. Supported Sensor Platforms include:

1. NV centers in diamond
2. Trapped ions
3. Cold atoms
4. Bose-Einstein condensates
5. Neutral atoms
6. Rydberg atom arrays
7. Superconducting qubits
8. SQUIDs
9. Photonic interferometers
10. Silicon spin qubits
11. Quantum dots
12. Spin defects in silicon carbide
13. Rare-earth ion crystals
14. Optomechanical resonators

Quantum Walks

We have ported the QuantumWalk.jl project to work with the Automatski Quantum Computer backend. It supports

Models

1. Szegedy
2. CTQW and CTQWDense

Dynamics

1. Quantum Walk Evolution
2. Quantum Search

Efeuresi – Smaller Equivalent Quantum Annealing Models

Efeuresi is a platform for discovering state-of-the-art equivalent quantum annealing models. It integrates as a preprocessing step in your quantum annealing solution pipeline. It typically discovers 30-50% smaller models that are a dropin replacements of your original models.

Anakalypse – Smaller Equivalent Quantum Circuits

Anakalypse is a platform for discovering state-of-the-art equivalent quantum circuits. It integrates as a preprocessing step in your quantum computing solution pipeline. Currently it works only with Qiskit but in the future we will port it to other frameworks also. It typically discovers 70-95% smaller circuits that are a dropin replacements of your original quantum circuits. It can reduce both the number of logical qubits and also the number of quantum gates. In tests with circuits with trillions of gates it achieved a 100,000X+ reduction so 95% reduction isn't a hard limit. It is just a general use case result.

Palmos – Quantum Pulse Programming

Palmos is a scalable high-performance Quantum Pulse Programing platform

Optimus – Tensor Network Quantum Simulator

Optimus is probably the most scalable and high performance Tensor Network Quantum Simulator. Which can be used through the Automatski SDK. It can go beyond the scale of any Tensor Network Quantum Simulator in existence.

Optimus – Quantum Framework

Optimus is a Quantum Programming Framework which uses Tensor Networks to solve problems in quantum physics, quantum chemistry etc.

RSA Integer Factorization Cryptography World Record

We hold the world record for the largest RSA Number factorized using Shors Algorithm on Quantum Computers using 126 Logical Qubits. Automatski has also developed and tested dozens of Cryptography Algorithms in its labs. Github Repository With Source Code & Results

ECDLP (Bitcoin) Cryptography World Record

We hold the world record for the largest bit strength ECDLP cracked using Shors Algorithm on Quantum Computers using 63 Logical Qubits. Github Repository With Source Code & Results

QKaDence

QKaDence is a complete industrial strength QDK Simulator Platform that contains

1. QKD simulator
2. QKD network simulator
3. Quantum network digital twin
4. Security testbed
5. Telecom planning platform
6. KMS simulation platform
7. Research framework
8. Education platform
9. Cloud-native simulation system

*** It is currently being tested and very soon will be offered for trials.

Quantum Monte Carlo

Our Quantum Monte Carlo Framework supports

1. Ground state methods: VMC, DMC, GFMC, AFQMC, FCIQMC
2. Finite temperature: PIMC, CT-QMC, SSE
3. Diagrammatic / expansion-based: DiagMC, SSE
4. Lattice-focused: Worldline, SSE, LQMC
5. Quantum chemistry: AFQMC, FCIQMC, DMC

Sizer – Quantum Resource Estimation

Sizer is a standalone quantum resource-estimation tool for OpenQASM 2.0 and 3.x files.

It gives:

1. Circuit width, classical width, operation counts, gate histogram, measurements, resets, and barriers.
2. Dependency depth based on the qubits touched by each operation.

3. Clifford, explicit T, and arbitrary-rotation counts.
4. Synthesized T demand, surface-code distance, magic-state factory count, physical qubits, execution time, and estimated logical failure probability.

Linear Order Monte Carlo

Quantum Monte Carlo (QMC) in Qiskit uses quantum computing primitives to achieve an almost quadratic speedup over classical stochastic integration methods. Instead of relying on random physical or pseudo-random samples, Qiskit implements this via Quantum Amplitude Estimation (QAE), transforming standard sample counting into a phase measurement problem. While classical Monte Carlo error scales as O(1/sqrt{N}), quantum methods achieve a scaling of O(1/N) for N quantum operations.

We have invented a Monte Carlo Algorithm which works in Linear Time and is O(N) and we have benchmarked it on 10 different problems. Our Algorithm is Universal and can be applied to any use case in which Monte Carlo Algorithms have been previously applied.

Thorium Reactor Simulation

Not Started! We can implement this but it would take 2-3 years and $200-500 million

Claret - Nuclear Fusion Plasma Simulation

Claret is a plasma simulation quantum platform. It can be used to simulate plasma ab initio at 100-200 million degrees. And hence can be used to design the worlds first sustained and net-energy-positive controlled nuclear fusion tokamaks.

We can do the plasma simulations but designing and constructing a physical tokamak based on the simulations would take 5-7 years and $2-5 billion

The Millennium Institute

Planned!

To setup an institute in California for education of technologies which will shape the future of mankind.

KryoSAT – Cryptographic SAT Solver

KryoSAT is a XOR Normal Form SAT Solver. Which can be used for AES, SHA, RSA and other Cryptographic Applications.

GigaBit SAT – Very Very Large Scale SAT Solver

GigaBit SAT is designed to solve very very large scale SAT Problems on Supercomputers and HPC infrastructure. We have tested it with VLSAT Benchmarks from Inria France. The best SAT

Solvers are inherently single threaded, attempts to make parallelized and distributed SAT Solvers that actually deliver efficiency and benefits have given mixed results so far. GigaBit SAT has succeeded where such attempts have previously failed.

Since we don't have a Supercomputer or HPC Infrastructure we have created a single computer multithreaded (multi-core) algorithm to prove the concept and benefits. In future we will need to reengineer and build it over MPI.

Diadromi - Vehicle Routing Problem, Travelling Salesman Problem, Hamiltonian Path/Cycle

Diadromi can solve more than 2 dozen variants of the travelling salesman problem, vehicle routing problem and hamiltonian paths and cycles. With upto 100,000 locations. In the future we can extend it to millions of locations if needed. It is benchmarked on problems from TSPLIB and VCRPLIB.

Post Transformer Architectures – Future AI Models

Current AI is economically unviable and needs 100's of billions of dollars of datacenters, compute, energy and water. Most of them are made using transformers.

Automatski makes AI models which are 10X-100X smaller, cheaper to train and run, and at par or even better than current AI models. By using completely new AI Architectures instead of transformers, Novel Training Algorithms and custom ASICs for inference.

Quantum Transformers

We implemented transformers that can deal natively with quantum mechanics to solve a variety of problems in quantum physics and chemistry. And we have benchmarked it with 30 use cases.

Earlier we had implemented Neural Quantum States and Fermi Neural Networks which we release on github but they performed extremely poorly in benchmarks.

Quantum Large Language Model

A complete training and inference pipeline for a quantum large language model. It's a reference implementation. It can execute over the built in Quantum Simulator or on the Automatski Quantum Computer.

Besides which we have "ported" Llama 2/3/4 models to Quantum and achieved 190X reduction in computational effort and 40X reduction in VRAM.

Backless

We have eliminated Backpropagation from the AI Model Training workflow. Its scalable to billion parameter models. And because it does not rely on calculus or chain rules, it can easily train systems that include non-differentiable components. The training effort is almost the same as the inference effort. Which makes this one of the most promising options to train large scale AI models.

CoLeMo

CoLeMo is a contrastive learning models framework which implements multiple CLMs.

Stepper – Reasoning

Stepper Reasoning is a Hierarchical Reasoning Model

Stepper – Text

Stepper Text is a 1B text generation model based on the Hierarchical Reasoning Model architecture, strengthened by task completion and latent space reasoning

Autodidact

An AI designed to be like a baby, it plays with the given environment and learns from its own successes and failures. There is no need for any dataset. It just needs a virtual environment which it can control and observe. This might seem like a low utility fringe AI model but it in fact has the most powerful capability achieving potential. Autodidact can for example learn to program in 20 programming languages and beat the worlds best trillion parameter AI models on coding very soon.

Imago Dei

Is a World Model (Physical AI) which evolves by doing, observing and learning. It is different from other observational learning models because it builds a model of the physics of the world in the process. And its kinematics and inverse kinematics learnings can be implanted in any robot quadrapeds, humanoids, arms. And it is in a sense universal because it doesn't start with anything specific to the physical robot it is placed inside.

GupShup

A Multilingual set of ASR and TTS models. That are under 700 million parameters and 30ms response times (local).

We have also used it to build a pipeline: a cascade of four components, each running in its own thread and connected by queues

1. Voice Activity Detection (VAD)
2. Automatic Speech Recognition (ASR)
3. Language Model (LLM)
4. Text to Speech (TTS)

Maestro

Maestro is an AI Native Automated UI Testing Framework

Sophia

Sophia is a queryable LLM Wiki. Users can upload Markdown, PowerPoint, PDFs, Word documents, and more. It can be consumed:

1. Manually through the Web UI
2. Through the API (w/ Bots)
3. Through Natural Language Queries

Circumspection – Vision-Language-Action

Circumspection is an implementation of extremely scalable and efficient Vision-Language-Action Models.

DeepThought - Transformers

DeepThought is an implementation of extremely scalable and efficient Transformer Models.

Mimesis

Mimesis is an implementation of a family of embodied foundation models

Cybernetic

Cybernetic is a reference implementation of JEPA models for Robotics

Neutron – GPU Kernel Optimization

Neutron is a GPU Kernel Optimization Platform which has been tested on KernelBench.

Quantus – Natural Language Driven Quantum Computing and Annealing

Quantus is a web based natural language driven quantum computing and annealing platform. Users can describe their problems to Djinn and it will write code to solve the problem, run

simulations, and show the results to the user. The user can then ask for a downloadable report, a deployable package, benchmarks etc.

It can work with Automatski's Quantum Computers and Annealers.

Djinn – Natural Language Driven Engineering

Djinn is basically the worlds first artificial engineer, users can describe their problems to Djinn and it will write code to solve the problem, run simulations, and show the results to the user. The user can then ask for a downloadable report, a deployable package, benchmarks etc.

Djinn knows CFD, FEA, Aerospace, Aerodynamics, Propulsion, Orbital Engineering, Robotics, Thermal, Energy, Chemical, Materials, Control, Digital Twin, Inverse Problems, PINN, Optimization, Climate, Safety, Plasma physics, Nuclear Fusion, Magnetohydrodynamics, Nuclear Reactors, Neutron Transport, Radiation Physics, Semiconductors, Electromagnetics, Electronic Devices, Materials Engineering, Topology Optimization, Advanced Manufacturing etc.

Vlepo – 3D, 4D & Natural Language Driven Gaussian Splatting

Vlepo is a 3D, 4D and Natural Language Driven Gaussian Splatting Engine made in rust. With applications to

3D

1. Virtual and Augmented Reality (VR/AR)
2. Robotics and Autonomous Navigation
3. Simultaneous Localization and Mapping (SLAM)
4. Surveying, Mapping, and Digital Twins
5. 3D Asset Generation & Text-to-3D

4D

1. Film Virtual Production and VFX
2. Live Sports & Free-Viewpoint Replays
3. Autonomous Driving Simulation
4. Pre-Visualization and Remote Scouting
5. Medical and Scientific Visualization

Kaneez – Persistent AI Agent

Kaneez is an always-on, persistent AI agents meant to handle ongoing responsibilities, projects, and multi-day workflows rather than just answering individual prompts

Habitat – Self Evolving Agents

Habitat is a self-evolving agents framework made in python which is then packaged and launched as a docker container.

Pandora – Agent OS

Pandora is an AI Agent Operating System which has scheduling, context switch, memory management, storage management, tool management. And comes with an SDK. Everything is is then packaged and launched as a docker container.

Utopia

Utopia is Automatski's Quantum Unrestricted Boltzmann Machine Framework.

Unrestricted Boltzmann Machines are among the most expressive probabilistic models ever proposed, capable of learning arbitrary high-dimensional probability distributions and capturing complex interactions among large numbers of variables. A practical breakthrough in training and inference for unrestricted Boltzmann Machines would enable fundamentally new approaches to optimization, probabilistic reasoning, generative AI, and scientific discovery. Such an advance could significantly expand our ability to solve complex combinatorial, inference, and decision-making problems that remain computationally challenging for today's machine learning methods. As a result, Utopia an efficient unrestricted Boltzmann Machine algorithm represents a major milestone in both artificial intelligence and computational science.

Pithanos – Probabilistic Programming

Pithanos is a breakthrough in Probabilistic Programming which is 4-5 orders of magnitude faster or 6000X-55000X faster than all other Probabilistic Programming Frameworks out there.

Akida – Spiking Neural Networks

Akida (Automatski) is a superfast, milliwatt scale engine for applications like

1. Event-Based Computer Vision
2. Autonomous Drone Swarms
3. Predictive Maintenance for Industrial Equipment
4. Neuromorphic Cybersecurity
5. Healthcare Monitoring & Wearables
6. Brain-Computer Interfaces (BCI)
7. Smart City Sensor Networks
8. High-Frequency Time-Series Forecasting
9. Robotics Perception and Control
10. Digital Brain / Cognitive Architecture Research

Which can be deployed on the edge, drones, uav's, robots using hardware like Intel Loihi 2, IBM TrueNorth, and BrainChip Akida. We have integrated Gymnasium and Stable Baselines3 and created a reasonable ML & RL framework over and above spiking neural networks.

Diastaseis

Diastaseis is a production-grade Hyperdimensional Computing (HDC) / Vector Symbolic Architecture (VSA) framework for building cognitive computing, reasoning, classification, optimization, memory, graph processing, symbolic AI, neuromorphic AI, and hybrid AI systems using high-dimensional vectors. It supports the 11 variants of HDC.

Quantum Finance

There are three main problems in finance suitable for solving using quantum computers and quantum annealers.

1. Portfolio Optimization – optimizes portfolios with 1000's of assets using Automatski's quantum annealers. Demo Github
2. Option Pricing – pricing of 6 variants of options and portfolios of options using Automatski's quantum computers. Demo Github
3. Risk Management – uses Automatski's quantum computers

e^{QAOA}

An implementation of the Hybrid QAOA Algorithm with 4 breakthrough innovations that help it solve generic problems represented as Pauli Exponentials.

e^{QNN}

An implementation of the Hybrid QAOA Algorithm with 4 breakthrough innovations that help it train and execute arbitrary parameterized quantum circuits in the form of quantum neural networks to solve problems exponentially faster and massively more accurate than classical neural networks.

Lotus - Drug Discovery

We have four production scale drug discovery applications:

1. Lotus Fold – Abinitio Protein Folding application which can fold unknown proteins of 2000+ aminoacids Demo
2. Lotus Dock – a production scale protein-ligand docking application Demo
3. Lotus Allosteric Site Prediction – production scale application using both annealers and quantum computers Demo
4. Lotus Inverse Fold - Inverse protein folding is the computational process of finding an amino acid sequence that will fold into a specific three-dimensional protein backbone

structure. While traditional protein folding predicts 3D shapes from sequences, inverse folding designs custom sequences for therapeutics, enzymes, and artificial biomolecules.

Angelioforos - mRNA Design & Optimization

Supported Architectures & Engineering Formats:

1. Conventional linear mRNA
2. Circular RNA
3. Self-amplifying RNA
4. Trans-amplifying RNA
5. Self-amplifying circular RNA
6. Modified-nucleoside mRNA
7. Unmodified mRNA
8. Multicistronic mRNA
9. Bicistronic/dual-expression mRNA
10. Replicon RNA
11. Engineered long-lasting mRNA
12. Cell-selective mRNA
13. Conditionally translated mRNA
14. Branched or multimeric RNA
15. Circular RNA rolling-circle translation
16. Noncoding regulatory RNA

Ultra Zapper – Antibiotics

Ultra Zapper makes Antibiotics for Superbugs.

Universal Druid – Drug Discovery

Universal Druid is an end-to-end, general-purpose drug discovery platform. Its core USP is a novel AI that efficiently generates novel molecules and therapeutic designs—not merely screens existing libraries. ***It supports small molecules, antibodies, peptides, RNA therapeutics, gene therapies, vaccines, PROTACs, formulations, and combination therapies.*** Integrated target evidence, ADMET, toxicity, structure-based evaluation, and experimental feedback turn ideas into traceable, prioritized candidates. Universal Druid helps discovery teams explore more therapeutic possibilities faster while preserving scientific constraints, provenance, and human oversight.

Ptisi - Airlines Optimization

1. Flight schedule feasibility
2. Aircraft tail assignment
3. Fleet assignment
4. Crew pairing
5. Maintenance feasibility
6. Disruption recovery

Unified Optimization using Automatski's Quantum Annealers

Apothiki - Warehouse Optimization

Unified optimization of

1. robot routing
2. inventory placement
3. charging schedules
4. order batching
5. picker coordination

Using Automatski's Quantum Annealers.

QUBOverse

Reference Implementation of 112 QUBO formulations and their examples mentioned here
Demo

Jungle

Reference implementations of all the algorithms described in the Quantum Algorithms Zoo. All running on Automatski's Quantum Computers and Quantum Annealers.

e^{6G} – 6G Optimization

The emerging vision of 6G is AI controlling the network in real time.

The AI continuously solves and optimizes:

- Routing
- Scheduling
- Placement
- Energy
- Spectrum
- Compute allocation

Unified optimization of the entire 6G network with AI using Automatski's Quantum Annealers as co-processors.

Optiti – Optimization Suite

1. Power Grid & Utility Optimization
2. Renewable Energy Optimization
3. Energy Storage & Batteries
4. Electric Vehicles
5. Oil & Gas Optimization
6. Nuclear Grid Optimization
7. Smart Grid & IoT
8. Maintenance & Reliability
9. Energy Trading & Markets
10. Hydrogen Economy
11. Carbon Capture & Climate

A collection of 41 Kickstarter Use Cases for Optimization using Automatski's Quantum Annealers.

MoonBeam – Optimization For Defence

MoonBeam is a collection of 100 reference optimization use case implementations for

1. Army
2. Navy
3. Air Force
4. Cyber Force
5. Space Force

Which can be solved using Automatski's Quantum Annealers

Drona – Drone Optimization

Drona is a collection of 10 reference use cases of optimization problems related to drones.

1. Multi-Drone Task Allocation
2. Swarm Coordination
3. Sensor Placement
4. Interceptor Assignment
5. Airspace Deconfliction
6. Radar Scheduling
7. Resource Allocation
8. Communication Channel Assignment
9. Formation Optimization
10. Coverage Maximization

All of these are solved with Automatski's Quantum Annealers.

*** In the future we can create a similar suite of solutions for Droid Armies, or UAV's, or other Unmanned Mobile Units.

Choros – Space Solutions

Reference implementations of solutions to Satellites, Ground Stations, Space Traffic, Space Craft, Mission Planning, Rovers, Debris, Launch, Missile Warning problems

Solved with Automatski's Quantum Annealers.

Communicare – Telecom

15 telecom use cases solved using Hrohma. Demo

Megapolis – City Solutions

Reference implementations of 10 problems and their solutions in Cities

1. Traffic signal optimization
2. Ambulance dispatch
3. Waste collection routing
4. Water distribution optimization
5. Flood management
6. Metro/bus scheduling
7. EV charging placement
8. Police deployment
9. Fire brigade deployment
10. Air pollution mitigation

Solved with Automatski's Quantum Annealers

Hrohma – Graph Coloring

Billion node scale hybrid graph coloring solver using Automatski's quantum annealers for any of the following variants: see Demo

1. Vertex Coloring
2. Edge Coloring
3. Total Coloring
4. Weighted Coloring
5. Fractional Coloring
6. Dynamic Coloring

7. Online Coloring
8. Distance-k
9. List Coloring
10. Hypergraph Coloring
11. Geometric Coloring
12. Multicoloring

Missy

Missy is a solver to solve the Maximum Independent Set Problem with 100m+ Vertices and 1bn+ Edges.

Hyle - Materials Discovery Platform (** Classified)

A production grade quantum materials discovery platform that can solve

1. superconductors
2. battery materials
3. topological insulators
4. spin liquids
5. graphene systems
6. semiconductor design
7. photonic materials
8. magnetic materials
9. lattice models
10. quantum phase transitions

with 100's of millions of sites today.

Pyknotita – Density Functional Theory Simulations

DFT Simulations scale with $O(N^3)$ or worse, depending on the implementation, with problem size. Most DFT applications a suitable for a small range of problems. And the accuracy is major limitation.

Pyknotita has amazingly high accuracy and a universal applicability and can solve problems of 10's of thousands of atoms with reasonable resources. Pyknotita is cheaper for our customers than Qucca or UQE, and easy to get started with.

Mono – Molecular Dynamics Simulations

Molecular Dynamics Simulations scale with $O(N^3)$ or worse, depending on the implementation, with problem size. We have made several breakthrough innovations that help Mono run orders of magnitudes faster. Mono is compatible with the GROMACS binary .tpr input file format and has been tested on The Max Planck Institute GROMACS Benchmark.

Quantum Chemistry (** Classified)

Automatski has two offerings to solve production grade quantum chemistry problems today.

1. Qucca – A implementation of the Hybrid VQE Algorithm with 4 breakthrough innovations that help it solve molecules with 100's of electrons
2. UQE – Universal Quantum Eigensolver – A ground up implementation of hardware and software that does one thing and one thing only. Calculate the Ground Energy State of Molecules with ~10,000 electrons.

Liberty – Biology

Liberty integrates high-accuracy quantum chemistry, classical molecular mechanics, and machine learning to calculate binding free energies in large biomolecular systems

Heppy – High Energy Physics

6 high value use cases solvable by quantum computers and quantum annealers.

1. Many-body neutrino flavor oscillation | Automatski QC
2. Compact U(1) lattice gauge plaquette dynamics | Automatski QC
3. SU(2)-style color singlet dynamics | Automatski QC
4. CP(1) quantum spin-ladder energy scan | Automatski QC
5. Charged-particle track reconstruction | Automatski Annealer
6. Thrust-inspired jet hemisphere partitioning | Automatski Annealer

*** we omitted use cases that required AI/ML or Reinforcement Learning or Generative AI

Oil & Gas

Quantum Seismic Inversion

Seismic inversion is a computational technique that transforms seismic reflection data into quantitative subsurface rock properties such as acoustic impedance, porosity, density, and fluid saturation. It enables geoscientists to generate high-resolution reservoir models that improve hydrocarbon exploration, reservoir characterization, and drilling decisions. Since seismic inversion is a highly ill-posed, nonlinear optimization problem with many possible solutions, it requires solving extremely large inverse problems under complex geological constraints. Quantum computing has the potential to deliver computational advantage by accelerating optimization, Bayesian inference, and large-scale inverse problem solving, enabling faster convergence to higher-quality subsurface models while exploring a much larger solution space than conventional optimization techniques.

Demo (Synthetic Data)

Quantum Full Waveform Inversion

Full Waveform Inversion (FWI) is one of the most advanced seismic imaging techniques, using the complete seismic wavefield to reconstruct highly accurate subsurface velocity and geological models. It iteratively solves a large-scale nonlinear inverse problem by repeatedly simulating wave propagation and minimizing the mismatch between observed and simulated seismic data. FWI is computationally intensive because it requires thousands of forward and adjoint wave-equation solves over extremely high-dimensional parameter spaces. Quantum computing has the potential to deliver computational advantage by accelerating large-scale optimization, inverse problem solving, and linear algebra subroutines, enabling faster convergence, improved exploration of complex solution landscapes, and more accurate subsurface models for hydrocarbon exploration and reservoir development.

Quantum Reservoir Simulation

Reservoir inversion is the process of integrating seismic, well log, and geological data to estimate reservoir properties such as porosity, permeability, lithology, fluid saturation, and pressure distribution. It produces detailed three-dimensional reservoir models that support reservoir characterization, reserve estimation, field development, and production optimization. Because reservoir inversion combines multiple heterogeneous datasets into a large-scale, nonlinear inverse problem with significant uncertainty, it demands enormous computational resources and sophisticated optimization algorithms. Quantum computing has the potential to deliver computational advantage by accelerating large-scale optimization, probabilistic inference, and high-dimensional parameter estimation, enabling faster generation of more accurate reservoir models while improving uncertainty quantification and decision-making for exploration and production.

Quantum Reservoir History Matching

Reservoir history matching is the process of calibrating reservoir simulation models by adjusting geological and petrophysical parameters until simulated production data closely matches historical field observations such as oil, gas, water production, and pressure measurements. It is a large-scale, nonlinear optimization problem involving thousands to millions of uncertain parameters and repeated reservoir simulations, making it one of the most computationally demanding tasks in reservoir engineering. Quantum computing has the potential to deliver computational advantage by accelerating high-dimensional optimization, probabilistic parameter estimation, and uncertainty quantification, enabling faster convergence toward optimal reservoir models while exploring a significantly larger solution space than conventional optimization methods. This can lead to more accurate production forecasts, improved field development strategies, and enhanced hydrocarbon recovery.

MRI Reconstruction

MRI reconstruction is the process of converting raw frequency-domain (k-space) data acquired by an MRI scanner into high-quality diagnostic images. Modern reconstruction techniques

employ compressed sensing, parallel imaging, and iterative optimization to reduce scan times while preserving image quality and diagnostic accuracy. These methods require solving large-scale inverse problems involving high-dimensional optimization and repeated linear algebra operations, making them computationally demanding. Quantum computing has the potential to deliver computational advantage by accelerating optimization, sparse signal reconstruction, and large-scale linear algebra subroutines, enabling faster image reconstruction, improved image quality from undersampled data, and shorter MRI acquisition times that enhance patient throughput and clinical workflow.

CT Reconstruction

CT reconstruction is the process of converting thousands of X-ray projection measurements into high-resolution cross-sectional images of the human body using algorithms such as filtered back projection (FBP) and iterative reconstruction. Modern iterative reconstruction techniques significantly improve image quality, reduce noise, and enable lower radiation doses, but require solving large-scale inverse problems with repeated optimization and linear algebra computations. These computational demands increase substantially for high-resolution, spectral, and 4D CT imaging. Quantum computing has the potential to deliver computational advantage by accelerating optimization, inverse problem solving, and large-scale linear algebra subroutines, enabling faster image reconstruction, improved image quality from limited or low-dose data, and more efficient next-generation CT imaging workflows.

Vibrant Gaia – Weather Simulation

AI + Physics Hybrid Modelling.

100X-1000X faster than Traditional Supercomputer/HPC based Simulations

Demo

Sapphire Orchid – Realtime CFD Platform

A state of the art reference CFD Platform that can run CFD simulations over the below backends

1. Classic
2. AI
3. Quantum Inspired
4. Quantum Annealer
5. Quantum Computer

100X Faster 100X Bigger CFD Simulations Demo

Jedi – Constraint Programming

Implements 14 different constraint programming solvers to solve large scale problems, most accurately and the fastest possible.

Silk – PDE Solver

A Multiphysics/PDE Solver that solves 10X larger problems 10X faster.

Prota – Multi-Solver

Prota is one of the fastest solvers available for:

1. Linear Programming
2. Semi Definite Programming
3. Second Order Cone Programming
4. Integer Linear Programming
5. Mixed Integer Linear Programming
6. Binary Integer Linear Programming

Extensively tested and benchmarked for accuracy and 100,000 variable problems atleast.

Apollonius – SDP Solver (** Obsolete/Superceded)

Implements 5 different solvers to solve large scale Semi Definite Programming problems, most accurately and the fastest possible.

Grammikos – LP and MILP Solver (** Obsolete/Superceded)

Implements 6 different linear programming solvers and 1 mixed integer linear programming solver. To solve large scale problems, most accurately and the fastest possible.

Anuvanshiki – Genomics Platform

Planned!

Solves 12 reference optimization problems in Genomics using Automatski's Quantum Annealers. And solves 9 Grand Challenges in Genomics:

1. Multi-Omics Integration
2. Whole-Cell Modeling
3. Cancer Evolution Prediction
4. Drug Target Discovery
5. Regulatory Network Inference
6. Gene Regulation Prediction
7. Single Cell Atlas Construction
8. Genome Interpretation
9. Precision Medicine Prediction

Diakritos – Process Simulation

Diakritos is a large scale process simulation engine that is the most computationally efficient of all competing alternatives. We have built and tested it with 20 use cases

1. Semiconductor Fab Optimization
2. Airport Operations Simulation
3. Container Port Optimization
4. Hospital & Emergency Department Flow
5. E-Commerce Fulfillment Centers
6. National Power Grid Operations
7. Railway Network Scheduling
8. Urban Traffic Management
9. National Supply Chain Simulation
10. Telecommunications Networks
11. Military Logistics Networks
12. Integrated Air Defense Systems
13. Naval Fleet Operations
14. Cyber Defense Operations Centers
15. Disaster Response Planning
16. National Healthcare Digital Twin
17. Semiconductor Supply Chain Digital Twin
18. Global Maritime Trade Simulation
19. National Defense War-Room Simulation
20. Whole-Economy Digital Twin

Gnosi

Quantum Information Science Toolkit.

DoD War Room

Diakritos can easily simulate War Games and in fact has a reference use case for exactly that. But the latest generation of War Room/Game Simulators are built using AI. So we built DoD War Room, an AI Simulator for

1. Land Warfare
2. Naval Warfare
3. Air Warfare
4. Cyber Warfare
5. Space Warfare
6. Economic Warfare
7. *** Unified multi-domain simulations combining all of the above

Oikonomia – Economics Simulator

Oikonomia is an economics simulator that use real-world economic data to estimate how an entire economy will react to changes in policy, technology, or external shocks. Some example use cases are

1. Evaluate Trade Policy: Assess the impacts of tariffs, trade agreements, and shifts in global competitiveness.
2. Analyze Climate Policies: Calculate the economic effects of carbon taxes, emissions caps, and renewable energy transitions.
3. Assess Tax Reforms: Estimate how changes to income, corporate, or customs taxes will impact income distribution and government budgets.
4. Measure Infrastructure Impacts: Predict the long-term regional and national economic benefits of massive public works or transport projects.
5. Simulate Market Shocks: Understand how disruptions—such as supply chain failures or geopolitical conflicts—ripple through supply chains.

Oikonomia is a necessity to plan and run a country.

*** Testing and rollout has been stalled due to lack of economic data.

NP Suite

Rank	NP-Complete/Hard Problem	Breadth of Applications	Commercial Value
1	SAT / MaxSAT	★★★★★	★★★★★
2	Integer Programming / MILP	★★★★★	★★★★★
3	Constraint Satisfaction Problem (CSP)	★★★★★	★★★★★
4	Graph Coloring	★★★★★	★★★★☆
5	Maximum Independent Set (MIS)	★★★★★	★★★★★
6	Set Cover / Hitting Set	★★★★★	★★★★★
7	Traveling Salesman Problem (TSP)	★★★★★	★★★★★
8	Vehicle Routing Problem (VRP)	★★★★★	★★★★★
9	Quadratic Unconstrained Binary Optimization (QUBO)	★★★★★	★★★★★
10	Knapsack	★★★★★	★★★★☆
11	Clique	★★★★☆	★★★★☆
12	Steiner Tree	★★★★☆	★★★★★
13	Graph Partitioning	★★★★★	★★★★★
14	Hamiltonian Cycle	★★★★☆	★★★☆☆
15	Job Shop Scheduling	★★★★★	★★★★★

NP Suite is probably our biggest platform. It implements backends for 2000 (Two Thousand) NP Hard Problems across 100 Problem Families which cover almost every domain you can imagine.

Kentro - Data Center Optimization

Reference implementations of 20 Data Center Optimization Use Cases. Which will save $10m-$500m atleast per annum depending on the capacity of the datacenter.

Generic Quantum State Cloning Quantum Gates (** Classified)

Automatski has successfully implemented Generic Quantum State Cloning Quantum Gates.

Non-Linear Quantum Computing (** Classified)

Researchers have shown that if non-linear quantum gates could be realized they would potentially:

- Solve SAT efficiently
- Solve MaxSAT efficiently
- Solve Graph Coloring efficiently
- Factor integers rapidly
- Solve many NP-complete problems
- Potentially solve #P-complete counting problems
- Distinguish exponentially close quantum states
- Break many cryptographic assumptions***

Or in other words we would be able to solve NP-Hard problems in Polynomial Time and that would imply that P = NP.

PolyChess – Polynomial Time Chess Game (** Classified)

Generalized versions of games such as Chess, Go, Checkers, Hex, Reversi, and Sudoku have become standard reference problems for evaluating advances in automated reasoning and algorithm design, illustrating how seemingly simple recreational games can capture the full computational power of some of the most difficult complexity classes known in theoretical computer science. If limited by depth they are PSPACE-Complete if you consider unlimited depth then they are EXP-TIME-Complete.

Automatski has solved EXP-TIME-Complete Generalized Chess in Polynomial Time. Please download our first builds of the chess game and play. Mac and Ubuntu builds coming soon.

Windows Installer

Picoletos - Fraud Detection (Benchmarks)

We applied Quantum AI to Production Grade Fraud Detection Problems with training datasets of millions of transactions. With a fixed stratified 70%/10%/20% train/validation/test split.

Accuracy: 99.9847%

Precision: 92.2404%

Recall: 96.2264%

F1: 94.1912%

PR-AUC: 98.2479%

ROC-AUC: 99.9525%

Confusion matrix: TN 1,270,748; FP 133; FN 62; TP 1,581

We can safely say that with Quantum AI Fraud Detection is now a solved problem.

Praetorian – Intrusion Detection System (Benchmarks)

We applied Quantum AI to Production Grade Network & Host Intrusion Detection Problems with industrial datasets. With a fixed stratified 70%/10%/20% train/validation/test split.

Dataset	Accuracy	Precision	Recall	F1	PR-AUC	ROC-AUC
CIC-IDS2017	99.7109%	98.7276%	99.8176%	99.2696%	99.9491%	99.9881%
ADFA-LD	91.5197%	60.4348%	93.2886%	73.3509%	84.4513%	97.1061%

We can safely say that with Quantum AI Intrusion Detection is now a solved problem.

Rainbow – Lattice Quantum Chromodynamics

Lattice QCD is a way to compute the behavior of quarks and gluons by placing them on a grid of points in space and time. Its main uses are calculating the masses of protons and neutrons, explaining quark confinement, and studying extreme states of matter like the quark-gluon plasma.

It is one of the applications used to stress test and benchmark supercomputers.

Dexameni – Quantum Reservoir Computing

Quantum reservoir computing (QRC) combines quantum dynamics with machine learning. It maps inputs into an exponentially large quantum state space (Hilbert space) using a fixed, untuned physical quantum system as a "black box" reservoir, training only a simple classical linear layer at the output. Top use cases include time-series prediction (such as chaotic systems and weather patterns), molecular property prediction for drug discovery, and image/pattern classification. Dexameni contains both classical and quantum implementations.

*** But No Quantum Advantage Found

Druid – Quantum Big Data/State Preparation/Quantum RAM

Druid is a python quantum computing framework which helps quantum algorithm developers to put classical data into the quantum computer. Druid does this by creating a quantum circuit that prepares the required quantum state. This circuit can be prepended into the main quantum circuit e.g. quantum machine learning algorithm etc. Druid supports Qiskit and Pennylane.

QHT – Quantum Hermite Transform

The **Quantum Hermite Transform (QHT)** is a quantum transform based on **Hermite functions**, which are the natural eigenfunctions of the quantum harmonic oscillator and provide an efficient representation of Gaussian and oscillatory wavefunctions. By exploiting the mathematical structure of Hermite polynomials, the QHT has the potential to accelerate computations involving continuous-variable systems, wave propagation, and quantum dynamics. Its most promising breakthrough applications include **quantum chemistry, materials discovery, drug discovery, quantum machine learning, quantum signal processing, medical imaging, hyperspectral imaging, and semiconductor simulation**, where Gaussian basis functions and harmonic oscillator models are fundamental. As quantum hardware matures, the QHT could become an important primitive for next-generation quantum algorithms, enabling more efficient simulations and data analysis than conventional transform techniques in these domains.

The QHT framework from Automatski is a modular quantum hermite transform framework which currently integrates with Qiskit but will integrate with more quantum programming frameworks in the future.

Brook – Online Quantum & Classical Algorithms

Brook is an Online Streaming Statistics, Machine Learning and Deep Learning Framework that allows the creation of online Classical and Quantum Algorithms.

Discovery

Given a dataset of inputs and outputs Neural Networks approximate a function that discovers the relationship between the inputs and outputs. It hence learns. Automatski is working on engineering other forms of automatic learning.

The Discovery framework does two things

1. Learns Real Valued Functions, and
2. Learns Digital Logic Gate Circuits

That approximate the relationship between the given inputs and outputs.

QGT – Quantum Game Theory

Quantum game theory extends classical game theory by incorporating quantum phenomena such as superposition, entanglement, and quantum strategies, enabling the exploration of strategic interactions that are impossible in classical models. It has the potential to transform optimization, multi-agent decision-making, and competitive resource allocation in domains including finance, telecommunications, cybersecurity, logistics, and defense. Quantum game-theoretic methods can produce more efficient equilibria, improve coordination among

autonomous agents, and reveal novel strategic solutions for highly complex systems. As quantum computing matures, quantum game theory is expected to become an important mathematical framework for designing next-generation intelligent systems that must operate under uncertainty, competition, and large-scale strategic interactions.

QGT is an implementation of Quantum Game Theory. It comes with classical and quantum implementations of 10 examples of Games.

Megara – Quantum Secure Enterprise Permissioned Blockchain

Megara is a Quantum Secure Enterprise Permissioned Blockchain Platform made in Rust. With Smart Contracts implemented using Web Assemblies.

It has been used to implement a Reference Public Sector Use Case with the following:

1. Digital Identity: Gives citizens self-sovereign control over credentials, certificates, and personal data to safely access welfare or public benefits.
2. Land Registries: Creates tamper-proof ownership records to prevent property fraud and clear title disputes.
3. Public Supply Chains: Tracks the delivery of medical supplies, infrastructure materials, or subsidized food items transparently.
4. Smart Contracts: Automates government financial workflows, budget allocations, and tax tracking safely.

Enigma – Global Peer To Peer Quantum Computing Network

Enigma is a Peer To Peer Quantum Computing Network. The public Trackers are hosted by Automatski and anyone can join and leave at anytime. The consumers use Automatski's Python Quantum Computing and Quantum Annealing SDK's to run quantum circuits and optimization problems in the Enigma Network. The producers host a node on their computers and provide built in Quantum Simulators and Annealers to consumers by offering their computers resources.

Enigma can be deployed privately by governments and enterprises. Or it can be deployed globally with Solana wallet integration so that consumers can consume quantum computing resources on a pay per use basis. 80% of the payments goto the producers and 20% is charged as Platform Fees.

Very soon Enigma producers will be able to offer Quantum Computers and Quantum Annealers from vendors like IBM, Rigetti, D-wave, IonQ, Fujitsu, Toshiba using connectors in the Host programs.

Enigma Clients will be a part of the Standard Automatski SDK's (Python)

Multiple Sequence Alignment

Multiple Sequence Alignment (MSA) is a core bioinformatics method used to align three or more biological sequences—such as DNA, RNA, or protein—placing similar or homologous residues into the same vertical columns. These alignments help scientists infer evolutionary relationships via phylogenetic analysis, identify conserved functional motifs or domains, and model protein tertiary structures. We have run problems from the PREFAB and SALMA-10aa datasets on Automatski's Quantum Annealer with production grade results.

De Novo Genome Assembly

De Novo Genome Assembly using quantum annealers is an method that reconstructs DNA sequences without a reference genome by translating the puzzle into a math optimization problem solved on Automatski's quantum annealers. It maps fragmented DNA reads into a Quadratic Unconstrained Binary Optimization (QUBO) problem to find the lowest energy state representing the correct sequence.

Dataset	Reads	Time	Contigs	N50	Longest
Raw paired	8,298,686	834.475 s	4,264,585	40	871
Error-corrected	2,969,452	263.201 s	54,291	1,383	22,714
QC error-corrected	2,969,452	215.766 s	54,291	1,383	22,714

Total assembly time: 1,313 seconds, or 21m 53s.

We have built a production grade system that has both classical and annealing backend implementations which have been tested on production grade genome datasets.

Topologia – Quantum Topological Data Analysis

Topologia is a scikit compatible Quantum Topological Data Analysis framework which uses Quantum for topological data analysis especially for things like:

1. Distance matrix
2. Simplicial complex construction
3. Boundary matrices
4. Persistent homology
5. Betti numbers
6. Hodge Laplacian
7. Landmark selection
8. Filtration optimization
9. Persistence diagram computation
10. Processing Massive datasets

Topologia delivers polynomial or exponential advantages over purely classical topological data analysis algorithms.

Acuity - Hyperspectral Satellite Imaging

Hyperspectral satellite imaging captures the Earth's surface across hundreds of contiguous spectral bands, producing a detailed spectral signature for every pixel. This enables precise identification of minerals, vegetation health, water quality, soil composition, pollutants, and

man-made materials, making it invaluable for precision agriculture, mining, environmental monitoring, defense, disaster response, and intelligence applications. The resulting datasets are extremely high-dimensional and computationally intensive to process, requiring advanced optimization, machine learning, and inverse modeling techniques. Quantum AI has the potential to deliver **exponential computational breakthroughs** for suitable algorithmic subproblems—such as quantum machine learning, quantum linear algebra, combinatorial optimization, and quantum simulation—enabling dramatically faster hyperspectral image analysis, anomaly detection, material identification, spectral unmixing, and target detection on datasets that are beyond the practical limits of classical computing.

3D Knapsack Problem

The 3D Knapsack Problem is a fundamental optimization problem that determines the most efficient way to pack three-dimensional objects into containers while maximizing value and satisfying space, weight, orientation, and stability constraints. Efficient solutions deliver significant benefits across logistics, warehousing, shipping, aviation, manufacturing, and e-commerce by increasing space utilization, reducing transportation costs, and improving operational efficiency. Breakthrough algorithms for the 3D Knapsack Problem can enable substantial cost savings, lower carbon emissions, and faster, more automated supply chain operations at global scale.

Quadratic Assignment Problem

The 2D QAP problem is to assign all facilities to different locations with the goal of minimizing the sum of the distances multiplied by the corresponding flows. The 3D version has three sets of entities that are simultaneously matched to optimize a quadratic cost function. Real-world applications of QAP span logistics, electronics, healthcare, and digital data analysis. We have benchmarked our solver on QAPLIB and random problems with upto 100,000 locations.

Equivalent – Classical Exponential Computing Advantage Framework (** Classified)

Equivalent is a classical framework that is equivalent to quantum computing in everyway and perhaps more universally applicable than quantum computing. It delivers exponential computational advantage like quantum computing.

Equivalent was designed at Automatski as a backup in case Quantum Computing didn't deliver on the promises. It is still available and is production ready. It is one of a kind and nobody else in the world has anything close to it. But it is for Automatski's internal use because if it is shared with customers its implementation would get disclosed immediately and it will get very easily reverse engineered. Because no one can program it without knowing its implementation.

So if there is something in quantum computing that doesn't work out then Automatski will exploit Equivalent.

HI-VQE – Production Grade Eigensolver

The HI-VQE Algorithm algorithm has achieved unprecedented levels of accuracy the 1.6 millihartrees threshold required for practical quantum chemistry applications, a standard referred to as 'chemical accuracy'. This is the first time such accuracy has been reached for production grade problems by using Automatski's quantum computer.

Convay-Mead (** Obsolete/Superceded)

Convay-Mead is a compact chip-design optimization framework for nine hard EDA problems:

1. Physical placement
2. Global routing
3. Chiplet partitioning
4. Thermal-aware 3D placement
5. Thermal optimization
6. Timing closure
7. Memory system optimization
8. PPA optimization
9. Design space exploration

Built using Quantum Mechanics.

Afrokrema — AI-Powered VLSI Design Automation Platform

Afrokrema is an AI-powered Electronic Design Automation (EDA) platform that autonomously discovers and optimize algorithms for semiconductor chip design. It provides a comprehensive RTL-to-GDSII workflow covering logic synthesis, floorplanning, placement, clock-tree synthesis, routing, timing closure, and physical verification. By integrating industry-standard open-source EDA frameworks such as OpenROAD, Yosys, and OpenSTA, Afrokrema enables engineers to automate complex VLSI design workflows. Its AI engine continuously explores design alternatives to optimize Power, Performance, and Area (PPA), reduce congestion, and improve design efficiency. The platform offers Python REST APIs, a Python Client SDK, automated benchmarking, and multi-objective optimization. Afrokrema aims to significantly reduce chip development time, engineering effort, and design costs while enabling the discovery of innovative optimization techniques.

Afrokrema3D — AI-Powered 3D Chip Design and LogicFolding Platform

Afrokrema3D is an advanced AI-powered EDA platform designed for next-generation 3D integrated circuits, heterogeneous chip stacking, and LogicFolding architectures. Built upon Afrokrema, it integrates Open3DBench, Open3DFlow, and OpenROAD to support multi-tier chip design, 3D partitioning, placement, routing, TSVs, hybrid bonding, and thermal-aware optimization. Its innovative LogicFolding capabilities enable the redistribution of logic circuits across vertically stacked silicon tiers to potentially reduce interconnect distances, latency, and power consumption. Afrokrema3D autonomously optimizes for tier partitioning, vertical interconnect placement, thermal management, timing closure, and 3D Power, Performance, and Area (PPA). The platform provides comprehensive 3D design workflows, multiphysics analysis,

visualization, Python REST APIs, and a Python Client SDK. Afrokrema3D aims to accelerate the development of high-performance, energy-efficient 3D processors, AI accelerators, and advanced semiconductor architectures.

ChipMunks

ChipMunks is a Chiplet Design and Engineering Pipeline which turns an application brief into a traceable RISC-V chiplet project with specifications, RTL, verification, exploration, physical-design evidence, and a portable delivery package. It gives architects one reproducible workflow for comparing monolithic and multi-die options without presenting estimates as measured silicon.

Its reference six-member SKY130 family of Chiplets spans AI, cloud/HPC, automotive, 5G telecom, consumer electronics, and medical/IoT systems.

Falcon AI and Atlas HPC address tensor and vector compute, while Sentinel Automotive and Wave5G combine deterministic control with domain-specific DSP. Vista Consumer targets efficient multimedia and edge inference, and Pulse Medical-IoT provides a compact safety- and security-oriented sensing platform.

Every member has passed generation, simulation, synthesis, design-space exploration, and SKY130HD RTL-to-GDS for the shared validation shell.

ChipMunks is an extensible engineering foundation and a reference implementation of a family of 6 RISC-V Chiplets.

VeriPy

Almost all maths in Python happens using NumPy and SciPy so probably the easiest way to accelerate Python is by accelerating NumPy and SciPy. There are dropin replacements of NumPy available that execute on Nvidia and AMD GPUs. We have implemented a dropin replacement of NumPy and SciPy which executes on FPGAs.

PytorchFPGA

Pytorch is the global standard for Training and Inference of AI Models. By default it has execution backends for running the AI Models on the CPU or on Nvidia CUDA. AMD has also implemented an ROCm backend, and Google has implemented a TPU backend which can be used in PyTorch in Google Collab. We have implemented a Backend for Pytorch for execution over FPGAs.

CuteASM

A High Level Assembler provides high level programming constructs and object oriented data structures. We have implemented 23 High Level Assembler dialects for 23 architecture families

e.g. x86, ARM, RISC-V, PowerPC, MIPS, LoongArch, AVR, MSP430, H8/300, ARC, CRIS, Epiphany, FT32, SPARC, s390x, m68k, PA-RISC, Alpha, SuperH, IA-64, VAX, AMDGCN, and WebAssembly.

X++ - Automatic Heterogeneous Compiler

Mojo Language built a language over Python and its entire compiler toolchain which enabled it to accelerate Python by as much as 65,000 times. The holy grail of compilers has always been an Automatic Heterogenuous Compiler which can take any regular source code without absolutely any metadata, markups, special libraries or annotations, just the regular code you and me write and automatically parallelize it and execute it transparently in parts over GPUs, NPUs, FPGAs, RISC-V, CPUs, TPUs. We built X++ which works with C/C++, Rust, Objective-C, Python, Go and accelerates them transparently upto 35,000 times in our benchmarks.

Automatic Heterogeneous Compilers are the Holy Grail of Compilers.

Omni.ai

Whether you have your pre-trained AI model in Pytorch, TensorFlow or ONNX and it doesn't matter whether you want to execute its inference on the Edge, IoT Devices, Risc-V, x86, ARM, GPUs, FPGAs or burn an ASIC itself. Our Omni.ai toolchain does just that.

Circuit Optimization

Given any circuit in BLIF Format our tool can compress it an emit a dropin replacement BLIF file.

Inverse Lithography Technology

Is an advanced computational method used in semiconductor manufacturing to mathematically calculate exact photomask shapes so light prints the intended nano-scale circuit patterns accurately onto a silicon wafer. Tested on LithoBench and ICCAD.

Verifyd

Verifyd is a hardware verification AI Framework made in Python based on UVM (Universal Verification Methodology)

Checkd

Checkd is a hardware verification AI Framework made in Python based on employing mathematical logic to exhaustively prove the correctness of specific design properties without needing manual testbenches.

Galaxy - MCP Server

The problem of scaling MCP Tools is that they takeup all of the LLM context, degrade results and cost a lot of money for tokens. The Ultimate Goal of all Enterprises is to connect all their Systems and APIs to their Onprem or Cloud based LLMs via MCP. So we created Galaxy which can scale to millions of tools with limited context requirements.

Memoirs

A Universal Memory API for AI Applications & LLMs. Its intelligent, learns and evolves.

Mimesis

Mimesis is an AI Model that helps a robot learn and perform physical tasks using just one or a few examples.

Gorrion

Is only 160KB in size and lets us run any AI model on Huggingface, even with trillions of parameters on any hardware even 4GB GPUs.

Schediagramma – Branching Programs

Schediagramma is a platform that offers near-optimal implementations of BDD, ROBDD, ZDD, MDD, ADD, MTBDD, EVDD, WDD, SDD, ZSDD, FBDD, unordered BDD, QRBDD, CE-BDD, tagged BDD, partitioned BDD, shared BDD, TDD, QMDD, and LIMDD. Its knowledge-compilation and reasoning stack includes NNF, DNNF, d-DNNF, structured d-DNNF, Decision-DNNF, SAT/CNF/CDCL, constraint graphs, factor graphs, junction trees, tree decompositions, and branch decompositions. For logic and algebra, it provides AIG, XAG, MIG, XMG, ITE DAGs, Boolean-expression DAGs, DSOP, ESOP, prime implicants, prime implicates, ANF, Reed–Muller, Zeta/Möbius transforms, polynomial decision diagrams, and Gröbner bases.

Its numerical and structural capabilities include LDD, DDD, DBM, Tensor Train, MPS, MPO, Hierarchical Tucker, TTN, PEPS, Tensor Ring, arithmetic circuits, probabilistic circuits, SPNs, ZDD optimization, MDD constraint programming, BDD–tensor hybrids, and adaptive representation switching. Its engine can solve structured problems containing millions of variables while reducing graph size, memory consumption, intermediate-state growth, and total computational effort. Its value proposition is simple: its extremely optimized models turn computations that would otherwise explode exponentially into smaller, faster, and more economically practical solutions. Its core value is making previously impractical computational workloads tractable while providing a modular foundation for many advanced solver families.

Dwave Examples

We don't have any access to any proprietary Dwave Source Code, Design Specs etc. But by just reading the problems they are trying to solve, we created a catalog of reference solutions to 36 Problems that run on the Automatski Quantum Annealer.

Polar Bear - GPUs

We are designing our own GPU architecture and silicon, spanning Edge, Desktop, and Data Center-class GPUs — built for the next generation of AI and high-performance computing.

From energy-efficient edge inference to desktop acceleration and massive data-center workloads, we are building a complete GPU compute stack from the ground up.

Our target: fabrication-ready designs within the next six months. And toolchains and compilers in another 4 months.

A big step toward building indigenous, world-class AI compute infrastructure — from software to silicon.

***Under active development ETA 2028

Giant Panda - NPU

We are building our own Neural Processing Unit (NPU) — a custom AI accelerator designed from the silicon up for high-performance AI inference and compute.

Our goal is ambitious: move from architecture and RTL to a fabrication-ready chip design within the next six months.

This is an important step toward building indigenous, vertically integrated AI compute technology — from algorithms and software all the way down to silicon.

The journey from AI software to AI silicon has begun.

***Under active development ETA 2028

Cerebrum – Neuromorphic Chip

Cerebrum is an Intel Loihi 2 class Neuromorphic Chip with the following specs:

1. Process Node: 7 nm EUV lithography
2. Die Size & Transistors: 31 mm² die size with about 2.3 billion transistors
3. Neurons: Up to 1 million per chip (~8,192 neurons per core)
4. Synapses: Up to 120 million configurable synapses
5. Cores: 128 neuromorphic cores and 6 embedded RISC-V processor cores
6. Core Memory: ~192 KiB of flexible SRAM per neuromorphic core

7. Power Consumption: Around 1 watt during standard operation
8. Software Framework: Open-source Lava

Cerebrum is Ready for Fabrication.

Systima – SoC

Systima is our next-generation RISC-V–based System-on-Chip (SoC) platform, designed to deliver high-performance, energy-efficient and customizable computing across a wide range of applications. Built around the open RISC-V instruction-set architecture, Systima combines programmable CPU cores, hardware accelerators, high-speed memory and peripheral interfaces into a tightly integrated silicon platform. Its modular architecture enables workload-specific acceleration for AI, robotics, edge computing, industrial systems and embedded applications. Systima is being designed as a scalable foundation for building sovereign, application-optimized computing systems without dependence on proprietary processor architectures.

Systima is Ready for Fabrication.

Verifyd – VLSI Verification AI Framework

Verifyd is a AI Framework for VLSI 'Functional' Verification using UVM (Universal Verification Methodology). It tests whether the chip logic matches the design specification under varied scenarios. It has a 4 stage pipeline: RTL parsing, verification context, AI testbench generation, and simulation with error feedback.

S^3 – Single Shot Solutions

How do people solve CFD or PDE problems for example? They run a simulation with boundary conditions and constraints. What if there was a better way? Something that was exponentially faster.

We have created Generalized Operators for example for Navier-Stokes equation (**The Million Dollar Equation**) and other popular PDEs. We can do this for any System of PDEs, our methods are Universal.

We are now building Generalized Operators for Black Scholes (**The Trillion Dollar Equation**)

And Plasma Physics:

1. Maxwell's equations
2. Magneto-hydrodynamics (MHD)
3. Multi-fluid models
4. Vlasov-Poisson and Vlasov-Maxwell kinetic models
5. Drift-kinetic models for strongly magnetized plasma
6. MHD-kinetic hybrid models

What this allows us to do is to avoid running Costly and Lengthy Simulations on Supercomputers. We can simply calculate the Solution of the Generalized Operators and send it to the user. Problem Solved. Exponentially faster, even before you can pickup the phone and answer it, your solution is in front of you. **We are not simulating the systems of equations we are talking about calculating the solution.**

We call this entire field of Novel solutions – Single Shot Solutions.

NLC - Non-Linear Computing

We have implemented a novel type of non-linear computing and applied it to the optimization of

1. Power Grid
2. Telecom/6G
3. Semiconductors

With surprising effectiveness and computational efficiency.

Appendix B - Resources

[Youtube Channel (Demos)]

[Github Repositories]

*** Automatski is 25+ years old hence the product portfolio is large. Some of them are unfinished or have a lot of technical debt. It is clear that Automatski cannot make a successful business out of all of them. So Automatski is trying to rank and consolidate its most valuable products and park the rest.

Not all products are for sale because a lot of them cannot be deployed as is on the cloud or deployed on client infrastructure with an unbreakable licensing mechanism. Some are just frameworks or a bunch of code and tests put together. But they are indicative of Automatski's capability.

Automatski is not just a global quantum computing company it is a globally leading computing company. If anything needs to be computed by mankind Automatski will figure out how to do it the best way possible.

Don't be alarmed by the number of products and frameworks mentioned above. 50% of them are at a TRL <= 5 and need to be developed and adapted to the exact requirements of the customers. Not everything can be made into a general purpose platform. Only 50% of the above are at a TRL of 6-9 and a few at 10.