Onboard AI for Nanosat Clusters
Neuromation is a leading AI platform company based in San Francisco with offices around the world.

- Platform-as-a-Service
- Research and Development in DL/ML
- Synthetic data

Recognized by as a leading tech pioneer by WIRED and TC.
Company Overview

- Neuromation's vision is to democratize AI, making it more accessible, cost-effective, and easy-to-develop and deploy.

- The company has breadth of experience in applied AI across industries and is a pioneer in the use of synthetic data and deep learning for computer vision applications.

- The Neuromation Platform provides a single point of entry for computational resources, synthetic data generation, and AI talent. It is a suite of core horizontal technologies to democratize AI, making it more accessible, cost-effective, and easy-to-use.
Last year we proposed to conduct several research projects to perform scene understanding on satellite images. Many potential applications:

- Agriculture
- Earth Studies
- Ecology and Urbanistics
Land Cover Classification

Land Cover Classification With Superpixels and Jaccard Index Post-Optimization,

Read the publication

Read the publication

Read the publication
Our New Proposal: Plan

Onboard AI for Nanosat Cluster to reduce power and bandwidth requirements, combined with a blockchain-enabled registry for imagery to enable distributed access and cooperative analysis by global teams

- Improved hardware efficiency makes way for extra satellite payload.
- Allows distributed teams to conduct Earth Observation more efficiently.
- Reduce latency in real-time observation applications.
- Facilitate programmatic imagery analysis for multiple variables.
Our New Proposal: Plan

- Edge inference supporting Earth Observation
  - Dedicated AI chip/neural processing unit analyze images onboard satellite
  - Dramatically reduces data transfer and power requirements

- Hybrid blockchain to store results of all analyzed data
  - Private chain hashes for each image created by dedicated onboard hardware
  - Regular posting of associated hashes to public blockchain

- Let’s dive into the details...
Edge Inference Being Widely Adopted

- Latest generation of smartphones include dedicated AI processors:
  - Apple: A11 Bionic chip, Huawei Kirin 970, Qualcomm Snapdragon 845
  - ARM Trillium AI Project (includes dedicated object detection hardware)

- Drones
  - Skydio R1 Drone with auto-follow uses Nvidia Jetson TX2 AI computing device
  - DJI drones process images using the Myriad 2 VPU from Intel with dedicated Neural Compute Engine.

- Self-driving cars all have onboard neural networks.
  - Tesla’s planned Hardware 3 chipset will analyze 2,000 frames per second with full redundancy and failover - a 10x improvement over previous Nvidia tech.
Benefits of Edge Inference

**Improved power usage**
Once trained, complete tasks with greater efficiency, far less power drain

**Reduced latency**
Neural networks previously cloud or data center-resident leading to latency

**Improved security**
Alleviate data privacy concerns. Data not sent to cloud
Benefits of Satellite onboard AI

- Dramatically reduce data transfer requirements: reduce size of communications hardware
- Faster reaction time to events
- Less mass and volume dedicated to power supply and communications creates other opportunities for hardware payload, such as improved optics
- Reduced energy usage
DLT for Decentralized Registry of Satellite Imagery

- Single registry of imagery and image analysis
- Faster reaction time to events, improved coordination between distributed teams
- Opportunities for automation with smart contracts
- Allow for cooperation in research and analysis by distributed global community

Space Agencies
Private Sector
Educational Institutions
DLT Technical Solution

- Onboard hardware chip for creating cryptographic hashes (fingerprint of the system state) enabling trustless data security and a shared single source of truth.
- Private Blockchain with +10000Tps such as Exonum (Bitfury Group) for storage of detailed records and analysis
- Bulk hashes posted to Public blockchain, such as Ethereum, to account for limited transaction rate and scalability issues.

PRIVATE + PUBLIC = HYBRID DLT
Benefits of DLT Technology for EO Applications

- Facilitate cooperation by distributed teams
- Create a trusted imagery registry
- Enable low cost distributed public alert systems and programmatic analysis of imagery
- Enable data access by educational, government or business users
Powerful Combination of Edge AI and DLT for EO

- This powerful combination has only recently been enabled by latest-gen commercial hardware
- Potential to dramatically improve efficiency and access
- Applications for government agencies as well as education and private sector
Market Opportunities

- Create open marketplace for private nanosat operators
- Stimulate commercial nanosat manufacturing and launch systems
- Lower bar for entry for business users of data
- Allow for coordinated activity between organizations to solve global problems
  - wildlife protection, marine litter prevention and tracking, monitoring of illegal fishing activities, economic forecasting and many more.
- Opportunities for DL/ML development teams
  - Rewards model based on algorithm competition (similar to Kaggle)

We look forward to working with interested parties.
Data processing on-board — a new era of distributed EO
Our Team

Yashar Behzadi  
CEO

Andreas Wiese  
Chief Marketing Officer

Evan Katz  
Chief Revenue Officer

Sergey Nikolenko  
Chief Research Officer

Artyom Astafurov  
CTO

Maxym Prasolov  
Founder

Yuri Kundin  
COO

Evgeniya Zaslavskaya  
PR & Business Development (Russia & CIS)

Arthur McCallum  
VP Digital Economy

Fedor Savchenko  
VP of Research & Development

David Orban  
Adviser

Andrew Rabinovich  
Adviser