

Origami

Bringing AI to the very end of Edge

February 3, 2023

Problem: No Cloud, No AI

How AI works now:

1. IoT device sends data to Cloud DC
2. Data is processed by Cloud AI
3. Prediction is sent back to IoT device
4. IoT device actuates control

Cloud AI depends on network connection,

- Too **far** away to respond quickly
- Too **big** to run locally
- Too **expensive** unnecessarily

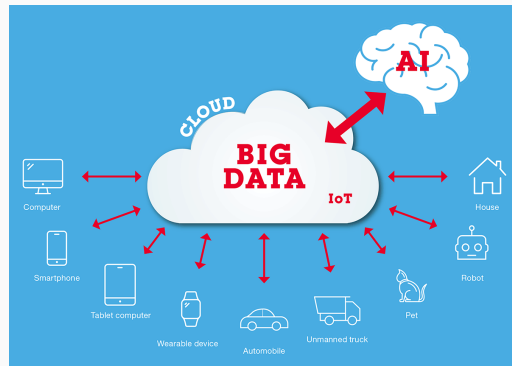


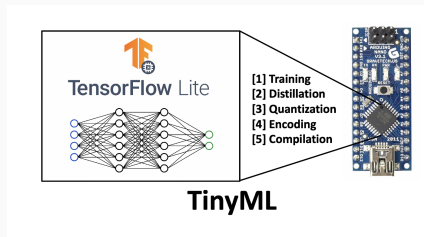
Figure 1: Big AI on Cloud

Solution: Cloudless AI with tiny Machine Learning

We *squeeze* ML smaller, *run* on microcontroller in IoT device, where sensor data is *processed* locally. This is called,

Tiny Machine Learning

1. Cloudless & Networkless
2. Small, fast & energy efficient
3. Cost effective



Market opportunity: *tiny AI Is Eating IoT*

- 2011, *Why Software Is Eating the World*, a16z
- 2017, *The End of Cloud Computing*, a16z
- 2019, *Software Ate The World, Now AI Is Eating Software*, Forbes
- 2022, *AI Accelerators Enter IoT SoCs*, EETIMES
- 2023, *AI Ate Software, Now tiny AI Is Eating IoT*, Origami

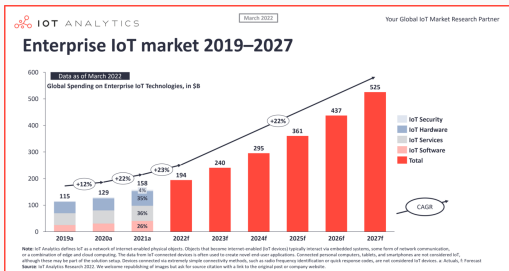


Figure 2: Enterprise IoT market

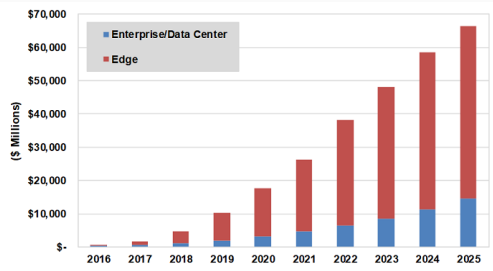
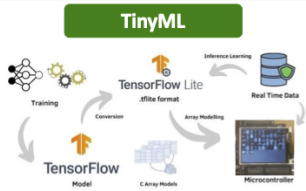


Figure 3: Deep learning chipset revenue

Product: TinyML as-a-Service (TinyMLaaS)

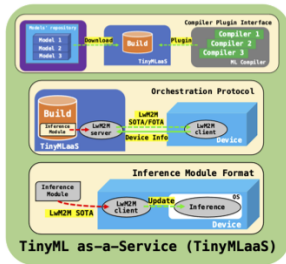


TinyML: cool and manifold benefits!

- 1 Energy efficient
- 2 Enables ML beyond network coverage
- 3 Privacy Preserving

But...is it enough?

TinyML as-a-Service: three “interfaces” for democratizing TinyML



	Device and ML service management capabilities	Orchestration and ML lifecycle capabilities	Connectivity management Capabilities	Network latency dependency
Cloud ML	Yes	Yes	No	High
TinyML	No	No	No	Low
TinyMLaaS	Yes	Yes	Yes	Low

Business model

Subscription

Type	Price / Month
Free	\$0 < 30H
SME	\$10K > 30H, inc 3 accounts
Enterprise	Contact sales > 3 accounts

Consulting

Type	Description	Price
Prof Srvc	Time & Materials	\$150 / H
Maintenance	Per ML model	\$10K / model / year

Marketing and sales strategy

Basically TinyML could be applied to any industries. **Now We focus on:**

Factory Automation

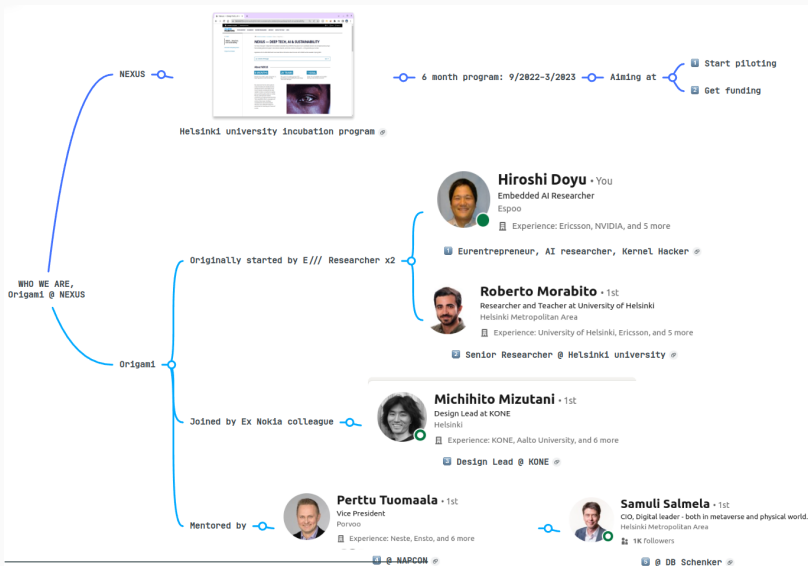


- Networkless AI Automation
- Cloudless Predictive maintenance
 - without big data storage
- Autonomous Emergency shutdown

HealthCare



- Cloudless Medical Gadget
 - with longer battery life
 - with privacy preservation
 - with small AI models



¹In detail, <https://www.mindmeister.com/map/2547854225>

History, Progress & Plan

- 09/2022 Origami started under NEXUS incubation program²
- 12/2022 On-site workshop held on customer premises
- 01/2023 A workshop report & piloting proposals sent
- 02/2023 Started co-development with University of Helsinki CS
- 03/2023 Agree on piloting project with *Letter of Intent* (LoI)
- 04/2023 Acquire funding with LoI
- 05/2023 Hire more developers
- 06/2023 Close a piloting contract
- 07/2023 Start piloting development
- 10/2023 Release 1st piloting product
- 12/2023 Start **TinyMLaaS** subscription service

²20 promising teams selected for mentor-driven NEXUS incubator programme

Ask for \$500,000

Finish alpha, Release beta & Hire key staff

Product Dev

\$100,000

- Frontend dev
(contract)
- UI designer
(contract)

New Hires

\$300,000

- Busidev mgr
- Frontend dev
- Backend dev
- Office mgr

Office & Other

\$100,000

- Hardware equipments for dev
- Monthly payments for Cloud

Origami

<https://Origami-TinyML.github.io/blog/about.html>

Bringing AI in the embedded systems world can spawn an exponential set of new applications. If you are thinking of boosting the AI capabilities of your services, our cloud-less and network-less TinyMLaaS is the right answer for satisfying your new requirements.