

Goal

Design, prototype and secure funding for a new Arm Cortex-based processor for embedded devices, capable of both traditional and neural network processing at the edge.

Solution

Hailo used Arm DesignStart Pro in order to quickly gain access to the IP necessary to create a prototype device, pairing a high-efficiency Arm Cortex-M3 CPU with its own proprietary hardware IP. Creating a viable proof of concept using Arm IP with no upfront license fee helped Hailo to secure \$16m in funding.

Benefits

- High-efficiency, high-performance compute acceleration for complex machine learning (ML) workloads
- Developers can use an established Arm toolchain to program the processor
- Enables independent real-time ML in devices at the network edge
- Supports all current neural network models
- Enables embedded ML in various applications including drones, cars, smart home appliances and cameras

Israeli start-up uses Arm DesignStart Pro to create proof of concept, secures \$16m in funding

Orr Danon, CEO of Israeli start-up Hailo, founded the company with a single vision: to enable edge devices such as drones, cars and smart home appliances to think for themselves by combining traditional compute processes with intuitive machine learning capability.

“Like the two hemispheres of the human brain, when it comes to solving a real-life problem it is the objective, logical side working together with the subjective, intuitive side that results in a decision,” says Danon.

Hailo’s designs employed tried-and-tested processor technology as a foundation for its own proprietary neural network hardware. In selecting a foundation, however, a low barrier to entry was paramount for the start-up.

With \$0 upfront license fees and a success-based, royalty-only model, the Arm DesignStart Pro program provided the ideal development environment in which Hailo could quickly and reliably prototype its SoC (system-on-chip) design.

“DesignStart Pro has proven invaluable to us,” says Danon. “It tackles the pain points typically experienced by early stage startups when funding is extremely tight. At this point in our journey we had to spend our money wisely, taking the custom approach in areas we wanted to really differentiate in while using readily available, high-quality IP and tools everywhere else.”



Hailo Co-founders Orr Danon, Hadar Zeitlin and Avi Baum

To build its prototype, Hailo selected the Arm Cortex-M3 processor, designed to enable high-performance, low-cost platforms for use in a broad range of devices.

“We chose the [Arm Cortex-M3](#) for a number of reasons,” Danon explains. “It’s an incredibly capable processor in its class, despite its low power requirements. By properly allocating what is running where and joining forces

between it and our own IP, we managed to create a highly capable yet also extremely power-efficient prototype.”

“Cortex-M3 also opens the door for us to augment our design with further Arm-based IP such as sensors and memory processors. Most importantly, the Arm processor acts as the ‘security guard’ for our whole device: secure boot ensures that firmware cannot be tampered with and all further processing occurs within the CPU’s trusted execution environment.”

An unparalleled ecosystem

Hailo’s multi-disciplinary team is made up of industry experts with system-oriented backgrounds, united in their belief in end-to-end solutions.

An important part of this, explains Danon, is co-designing the software and hardware.

“Creating robust hardware requires an equally robust software ecosystem with a tried-and-tested software toolchain. We’re not interested in forcing the industry to use non-standard toolsets; our toolchain will combine the standard Arm tools seamlessly with our own software development kit.

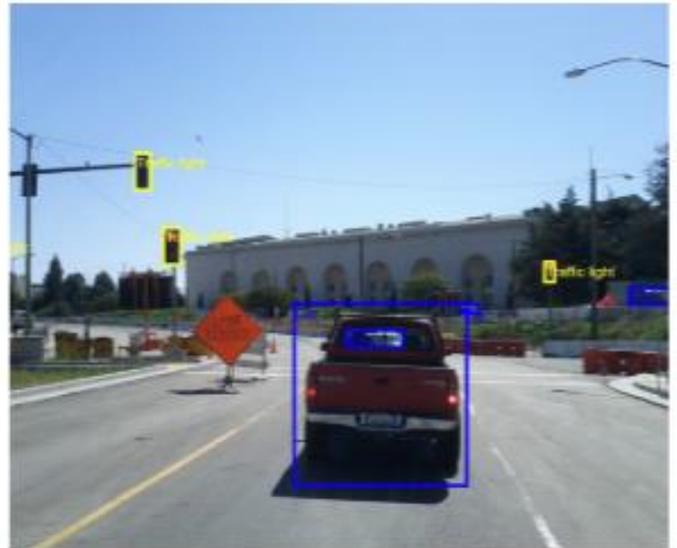
“Arm’s extensive software ecosystem, combined with the variety of support and resources that exist, made it the obvious choice for us to ensure successful adoption in the market.”

Getting funded

Prototyping using Arm DesignStart Pro enabled Hailo to design and demonstrate a comprehensive proof of concept to potential investors, helping to gather more than \$16m in funding from stakeholders, including Israeli crowdfunding platforms and a number of Angel investors.

“This funding will enable us to build on our prototype to create a finished product that fully represents our vision and demonstrates how successful this technology can be” says Danon. “This will be the candidate that enables us to enter mass production.”

While the Arm Cortex-M3 processor is more than sufficient for Hailo’s current use cases, Danon believes that the continuity of the Arm ecosystem provides a great springboard into more advanced Arm processors for higher performance applications.



Hailo’s key market, says Danon, is the automotive industry – specifically, its move towards autonomous driving technology. “Vehicle autonomy requires a lot of compute from an edge perspective; currently, an autonomous vehicle needs to be a tiny datacenter on wheels.

Our solution can accommodate high-level requirements for autonomous driving, and for that we may need a more powerful Arm solution such as dual or quad-core Cortex-A, or even Cortex-R, CPUs. Conversely, some solutions could incorporate an even lower-power Arm Cortex-M0 processor. Using Arm, we have complete flexibility.”

Learn more about how Arm is enabling machine learning at the edge [here](#). Interested in creating your own design with Arm DesignStart? Learn more about how to instantly access Arm processor IP with no up-front fee [here](#).