

SUCCESS STORY

Artificial Intelligence in Medicine
Skin Cancer Detection



AI Helps with Skin Cancer Screening

Drawing from a library of validated images, an AI bot can help detect skin cancer lesions and help aid the diagnosis.

“The long-term goal and true potential of AI is to replicate the complexity of human thinking at the macro level, and then surpass it to solve complex problems—problems both well-documented and currently unimaginable in nature.”¹

Challenge

Skin cancer has reached epidemic proportions in much of the world. A simple test is needed to perform initial screening on a wide scale to encourage individuals to seek treatment when necessary.

Solution

Doctor Hazel, a skin cancer screening service powered by artificial intelligence (AI) that operates in real time, relies on an extensive library of images to distinguish between skin cancer and benign lesions, making it easier for people to seek professional medical advice.

Background and History

Hackathons have proven to be a successful way to channel energy and technical expertise into solving very specific problems and generating bright, new ideas for applied technology. Such is the case for the genesis of Doctor Hazel, a noteworthy project at the TechCrunch Disrupt's San Francisco 2017 hackathon, co-developed by Intel® Software Innovator, Peter Ma, and Mike Borozdin, VP of Engineering at Ethos Lending and cofounder of Doctor Hazel. (see Figure 1).

Peter noted, “My cofounder and I had a very close mutual friend who died of cancer in his early 30s. That event triggered our desire to do something about curing cancer. After researching AI and cancer, we think we can actually do something—using AI effectively—to screen for skin cancer.”

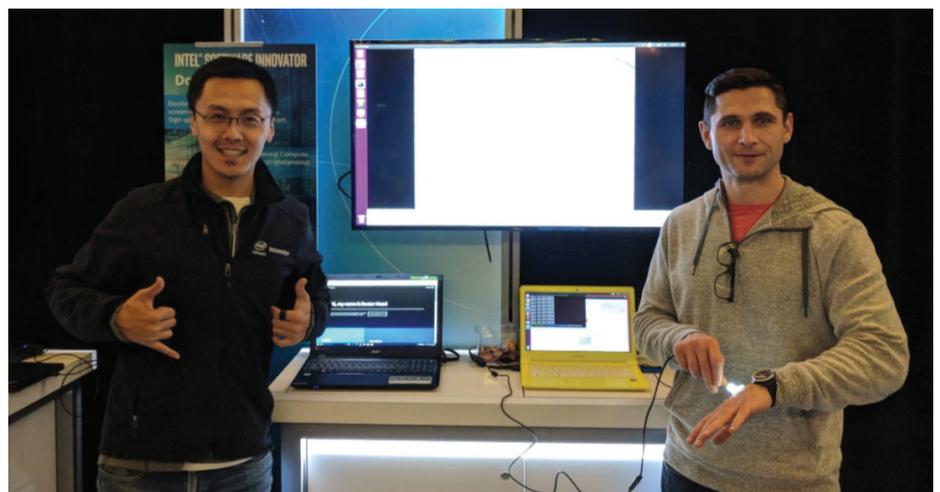


Figure 1. Peter Ma (left) and Mike Borozdin show screening techniques.

DEVELOP
THE FUTURE OF AI FOR ALL

With the purchase and aid of an inexpensive, high-powered endoscope camera to capture images, Peter and Mike launched into the creation of the Doctor Hazel website and presented the project at the TechCrunch hackathon to widespread acclaim. “Since we built the first prototype in September 2017,” Peter said, “we’ve been covered on TechCrunch, in *The Wall Street Journal*, *IQ by Intel*, and many other outlets and publications. Given our experience, we are confident that we can handle the technical requirements; our biggest challenges are US Food and Drug Administration (FDA) approval and gathering additional classified images.”

“For all startups,” Peter said, “the ideas are the easiest and execution is the hard work. Most of the projects fail because they can’t find the product market fit. I’ve built out hundreds of prototypes, but very few of them gained interest from anyone. When you show people the demo of Doctor Hazel, everyone wants to join the beta and help out. We are getting hundreds of inquiries every single week from people who want to donate data and try the service.”

Notable Project Milestones

- First introduction of the Doctor Hazel concept and prototype at the TechCrunch hackathon, September 2017.
- Launch of the Doctor Hazel website to explain the project and solicit images and information from parties that want to help build the database.
- Media coverage in a number of different outlets and publications, including *The Wall Street Journal*, TechCrunch, *IT by Intel*.
- Demonstrations of the project capabilities at multiple venues, including the Global IoT DevFest II, November 7 and 8, 2017.

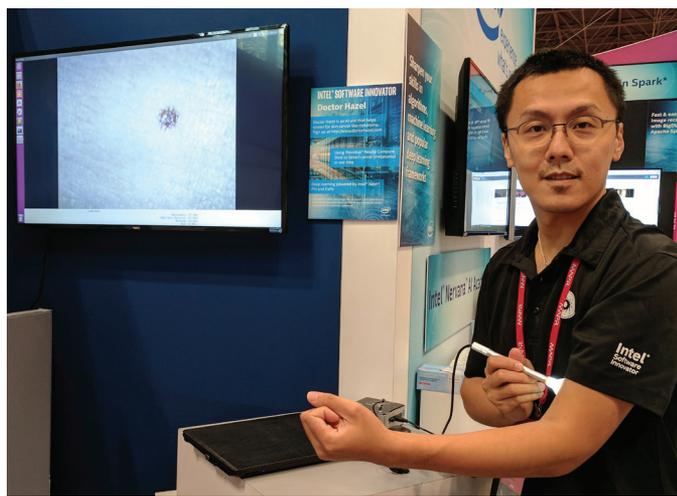


Figure 2. Peter Ma demonstrates the technology at Strata Data NY in 2017.

Enabling Technologies

The hardware portion of the project came together easily. Using a high-power endoscope camera acquired from Amazon for about USD 30, the team captured high resolution images of moles and skin lesions to compare with the images in the growing database.

Peter and Mike took advantage of Intel® AI DevCloud to train the AI model. This Intel® Xeon® Scalable processor-powered platform is available to Intel® AI Developer Program members for free and supports several of the major AI frameworks, including TensorFlow* and Caffe*. To broaden the utility

of this diagnostic tool, Doctor Hazel employs the Intel® Movidius™ Neural Compute Stick, which makes it possible to conduct screening in situations where no Internet access is immediately available.

“Intel provides both hardware and software needs in artificial intelligence,” Peter said, “from training to deployment. As a startup, it’s relatively inexpensive to build up the prototype. The Intel Movidius Neural Compute Stick costs about USD 79 and it allows AI to run in real time. We used the Intel® Movidius™ Software Development Kit, which proved extremely useful for this project.”

Contained in a USB form factor and powered by a low-power Intel® Movidius™ Vision Processing Unit (VPU), the Intel Movidius Neural Compute Stick excels at accelerating deep neural networks processing using the self-contained inference engine. Developers have the option of initiating projects with a Convolution Neural Network model, based Caffe or TensorFlow frameworks, using one of the multiple examples networks. A toolkit then makes it possible to profile and tune the neural network, then compile a version for embedding with the Neural Compute Platform API. [Visit this site](#) for tips to start developing with the Intel Movidius Neural Compute Stick.

An extensive image database of suspected and validated skin cancer lesions is a primary requisite for improving machine learning and boosting recognitions accuracy. Thousands of images were downloaded from the International Skin Imaging Collaboration, the Skin Cancer Foundation, and the University of Iowa to seed the learning process initially. In assessing a sample, Doctor Hazel gauges 8,000 variables to detect whether an image sample is likely to be skin cancer, a mole, or a benign lesion.

The driving goal of the project is to provide a means for anyone to get skin cancer screening for free. To build the image database and collect a broader sampling of confirmed skin cancer images, the [beta version of the Doctor Hazel site is soliciting input and data](#). In an [interview with TechCrunch](#), Mike commented, “There’s a huge problem in getting AI data for medicine, but amazing results are possible. The more people share, the more accurate the system becomes.” The team is working to advance recognition rates past the 90 percent level, a goal that gets closer as the image database expands.



Eventually, the team is planning an app to accompany the platform, and plans are also being considered for a compact, inexpensive image-capturing device to use in screening. An underlying goal of the project is to permit individuals to have themselves tested easily, perhaps at a clinic or through a free center using the real-time test system, and then seek a dermatologist or medical professional if the results indicate a high probability of skin cancer. Doctors will no longer need to perform the initial screening, allowing them to focus on patients that show a greater need for treatment based on a positive indication of cancer (see Figure 3).

Figure 3. Doctor reaching for a dermoscope to examine a patient's skin lesion.

AI is Opening Innovative Paths to Medical Advances

The use of AI in diagnostic medicine and treatment methods is creating new opportunities to enhance healthcare globally. Through the design and development of specialized chips, optimized software and frameworks, sponsored research, educational outreach, and industry partnerships, Intel is firmly committed to advancing the state of AI to solve difficult challenges in medicine, manufacturing, agriculture, scientific research, and other industry sectors. Intel works closely with government organizations, non-government organizations, and corporations to uncover and advance solutions that solve major challenges, while complying with governmental policies and mandates in force.

The Intel® AI portfolio includes:



Intel Xeon Scalable processors: Tackle AI with a compute architecture optimized for a broad range of AI workloads, including deep learning.



Intel® Movidius™ Myriad™ Vision Processing Unit (VPU): Create and deploy on-device neural networks and computer vision applications.



Framework Optimization: Achieve faster training of deep neural networks on a robust scalable infrastructure.

For more information, visit this portfolio page:
<https://ai.intel.com/technology>

For Intel® AI Developer Program members, the [Intel AI DevCloud](#) provides a cloud platform and framework for machine learning and deep learning training. Powered by Intel Xeon Scalable processors, the Intel AI DevCloud is available for up to 30 days of free remote access to support projects by Intel AI Developer Program members.

Join today: <https://software.intel.com/ai/sign-up>

“AI fundamentally will enable us to advance scientific method, which itself is a tool, a process that allows us to have repeatable, reproducible results. Now we need to incorporate more data into those inferences in order to drive the field forward. Gone are the days that a single person goes and looks at some data on their own and comes up with a breakthrough, sitting in a corner. Now it is all about bringing together multiple data sources, collaborating, and the tools are what makes that happen.”²

– Naveen Rao, Intel VP and GM, Artificial Intelligence Products Group

RESOURCES

Intel® AI Developer Program:
software.intel.com/ai

Skin Cancer Project in Intel DevMesh:
devmesh.intel.com/projects/ai-skin-cancer-detection

IQ by Intel article - Skin Cancer Detection Using Artificial Intelligence:
iq.intel.com/skin-cancer-detection-using-artificial-intelligence/

Deep-learning Algorithm for Skin Cancer Research:
med.stanford.edu/news/all-news/2017/02/algorithm-matches-dermatologists-ability-to-identify-skin-cancer.html

Doctor Hazel web site:
www.doctorhazel.com/

Doctor Hazel uses AI for Skin Cancer Research:
techcrunch.com/2017/09/17/doctor-hazel-uses-ai-to-try-to-determine-if-you-have-skin-cancer/

Getting the Most out of AI Using the Caffe Deep Learning Framework:
software.intel.com/ai/build-image-classifier

Intel® Distribution for Caffe*:
software.intel.com/ai/frameworks/caffe

Intel® Movidius(TM) Neural Compute Stick:
developer.movidius.com/

Dermatologist-level classification of skin cancer:
www.nature.com/articles/nature21056



¹ Carty, J., C. Rodarte, and N. Rao. "Artificial Intelligence in Pharma and Care Delivery," HealthXL. 2017. <https://tincture.io/artificial-intelligence-in-pharma-and-care-delivery-8e5bf0a5ae8b>

² <https://newsroom.intel.com/news/intel-accelerates-accessibility-ai-developer-cloud-computing-resources/>

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