



ASX PRESS RELEASE

ROTH Conference Presentation

San Francisco – 12 March 2018: BrainChip Holdings Ltd. (“BrainChip” or the “Company”) (ASX: BRN), a leading developer of software and hardware accelerated solutions for advanced artificial intelligence (AI) and machine learning applications is pleased to provide investors with a copy of the presentation that will be made today (Tuesday March 13 AEDT/Monday March 12 US time) at the 30th Annual ROTH Conference at the Ritz Carlton, Laguna Niguel, in Dana Point, California.

A copy of the presentation is attached.

BrainChip will also host one-on-one meetings with interested investors throughout the day.

About BrainChip Holdings Ltd (ASX:BRN)

BrainChip Holdings Ltd. is a leading provider of software and hardware-accelerated solutions for Advanced Artificial Intelligence and Machine Learning applications. The Company has developed a revolutionary new spiking neural network technology that can learn autonomously, evolve and associate information just like the human brain. The technology, which is proprietary, is fast, completely digital and consumes very low power. The Company provides software and hardware solutions that address the high-performance requirements in civil surveillance, gaming, facial recognition and visual inspection systems. www.brainchipinc.com.

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brainchip*

ASX CODE: BRN | "AN AI PROCESSOR COMPANY"

MARCH 2018

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Agenda

- Company and Business Overview
- Spiking Neural Network Technology
- Markets and Products
- Recent Announcements and Investment Highlights

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Company and Business Overview

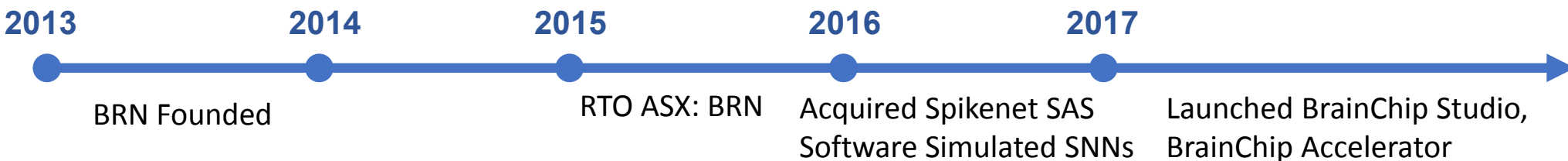


Company Overview



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- BrainChip is an ASX-listed (ASX: BRN) developer of artificial intelligence (AI) software and hardware.
- It is the global leader in the commercialization of Spiking Neural Networks (SNN) technology, an AI technology which mirrors the processing of the human brain and has multiple advantages over existing AI models. SNN requires fewer data images, less processing power, less data storage and is less costly to operate than other AI models.
- BRN's technology is patented and its products are globally deployed by government and institutional clients.
- BRN has existing video analytics products on market which demonstrate SNN technology.
- BRN is developing Akida™ a revolutionary Neuromorphic System-on-a-Chip general purpose processor.



Key Investment Considerations

- **Patented intellectual property** which is the result of ~10 years' development. BRN is one of the first commercial organizations globally to commercialise SNN AI technology.
- **Highly experienced management team.** CEO Lou DiNardo brings decades of tech commercialization experience and management team are seasoned Silicon Valley executives.
- **High-quality, global customer base across multiple industry segments.**
- **High margin, annuity revenue model.** The revenue model is moving away from customised tech deployment to upfront hardware/integrated software sales with annuity software and maintenance revenues.
- **Ready to scale.** New BrainChip Studio and BrainChip Accelerator products brings new focus on rapidly deployed scalable products.
- **Existing products growth potential through existing customer segments.** Immediate scale-up opportunities exist through existing verticals of law enforcement, national security, gaming, aviation and original equipment manufacturer collaboration.
- **Akida™ - Multiple new growth target markets.** The technology has applications in multiple growth segments.
- **Scarcity premium.** Public market investors have few opportunities to invest in pure-play AI companies.

Management Team



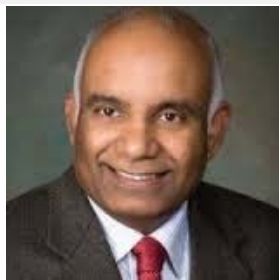
Lou DiNardo – President and CEO
Previously President and CEO of Exar, Xicor
President, Intersil
Partner at Crosslink Capital
Managing Director at Vantage Point Venture Partners
30+ years experience



Peter Van Der Made – Founder and CTO
Previously Chief Scientist, IBM Internet
Security Systems
Author: Higher Intelligence
40+ years experience



Ryan Benton – SVP and CFO
Previously CEO, CFO Exar
CFO, SynapSense, SoloPower
25+ years experience



Anil Mankar – Founder, COO and SVP Engineering
Previously VP of Engineering, Chief Development
Officer at Conexant
SVP of VLSI Engineering at Mindspeed
30+ years experience



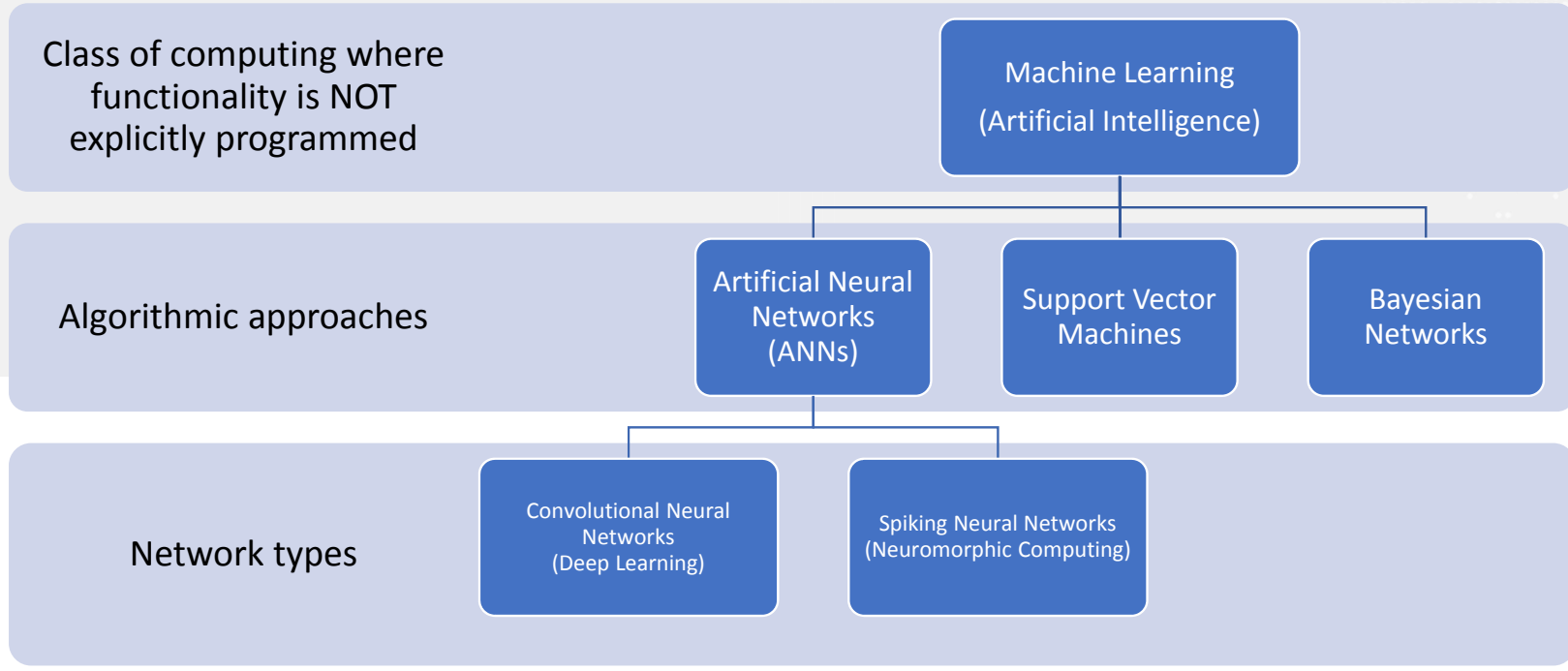
Robert Beachler – SVP Marketing and Business Development
Previously VP Marketing and Business Development at Exar
VP Marketing, Operations, Systems Design at Stretch Inc.
16 years at Altera
30+ years experience

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Spiking Neural Networks Technology



Machine Learning Taxonomy

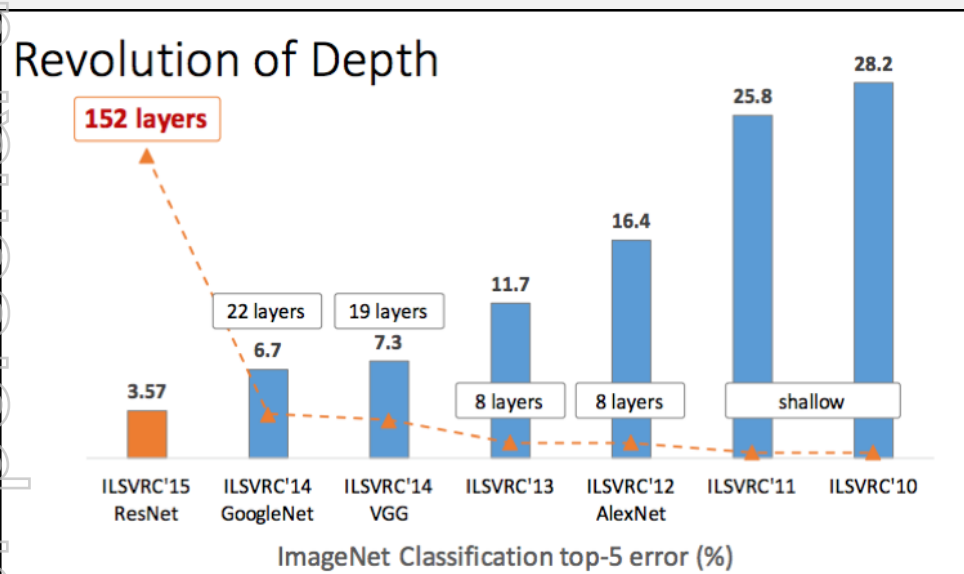


“An AI server has 8x the amount of logic content and 4x the amount of memory content compared to a traditional server .”

Goldman Sachs
Equity Research Note February 15 2018

Artificial Intelligence is Exploding, but Traditional x86 Compute is increasingly Costly and Inefficient

Artificial Intelligence has proven that it can SOLVE PROBLEMS that COULD NOT be solved using traditional programming, however x86 compute is INEFFICIENT (cost/power/latency) for AI applications.

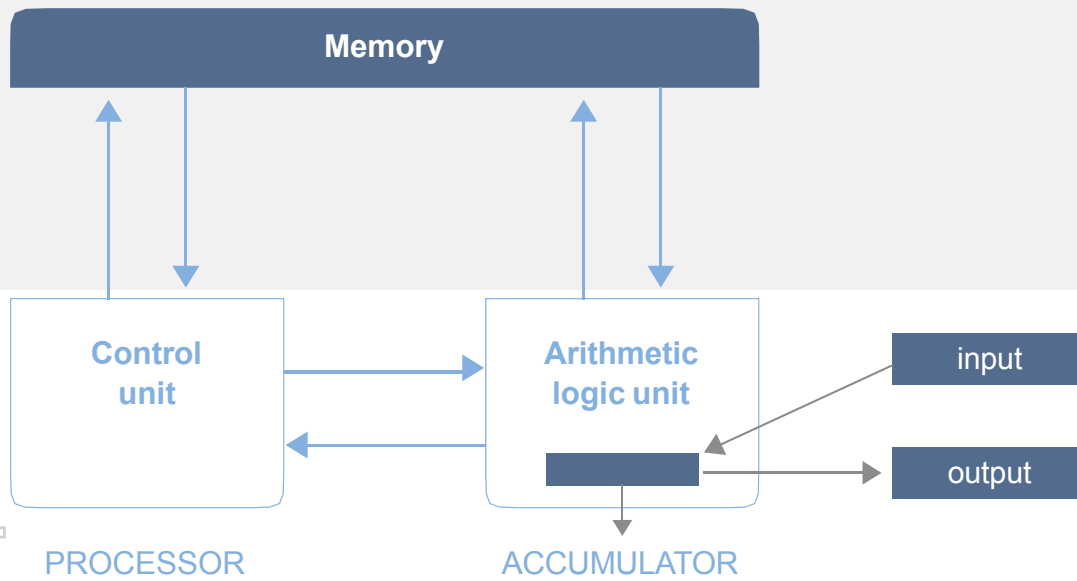


Source: arXiv:1512.03385 Deep Residual Learning for Image Recognition
Kaiming He, Xiangyu Zhang, Shaoqing Ren, Jian Sun

- **DATASETS** are available to train the AI
- **AI TRAINING METHODS** continue to provide a step function in accuracy
- **Compute requirements** are substantially different
- There is **SUFFICIENT** compute power however traditional x86 compute is **INEFFICIENT** (cost/power/latency) for CNN/deep learning applications.

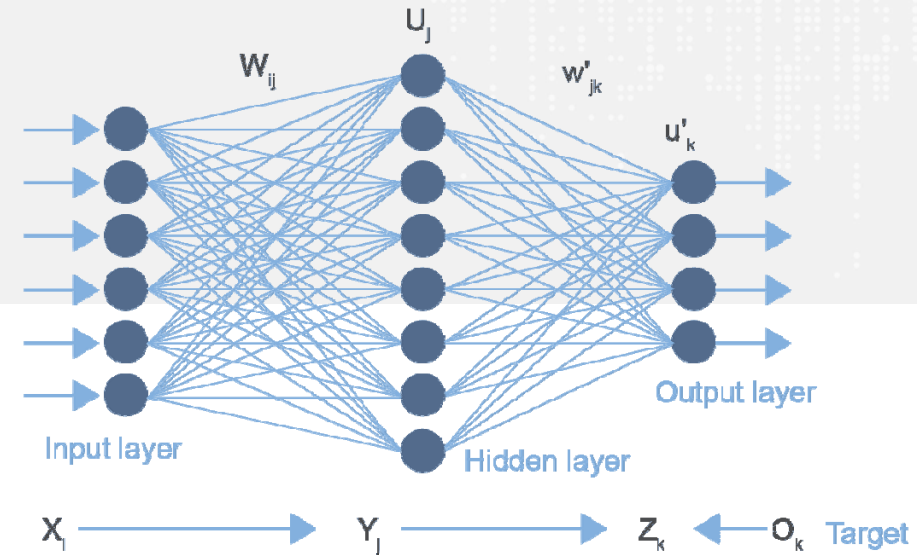
Traditional CPU Architecture Inefficient for ANNs

Traditional Compute Architecture



Optimal for sequential execution

Artificial Neural Network Architecture



Distributed, parallel, feed-forward



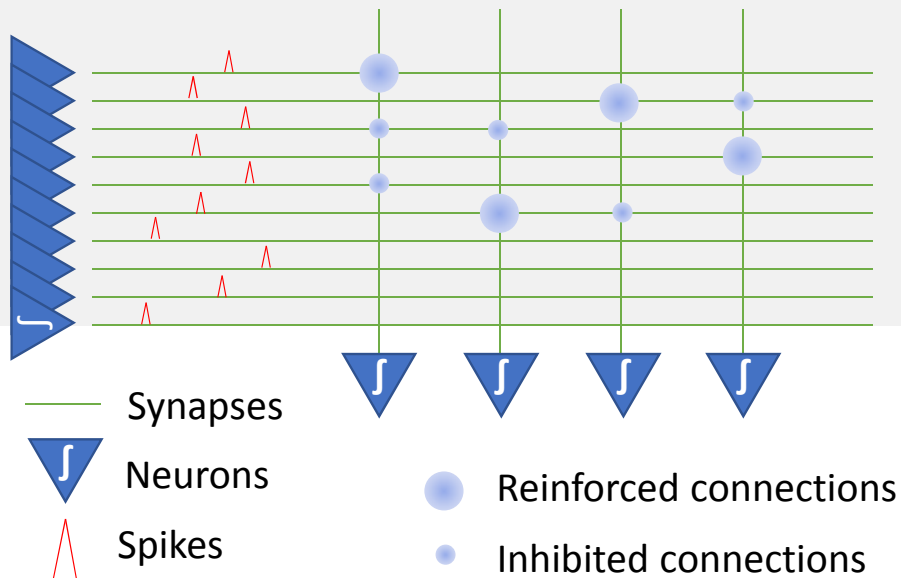
“We require exquisite numerical precision over many logical steps to achieve what brains accomplish in very few short steps.”¹

John von Neumann
Inventor of the digital computer

¹ Von Neumann J (1958) The Computer and the Brain. New Haven CT: Yale UP.

Spiking Neural Networks Function Like the Brain

The brain doesn't think in math functions!



Like a human brain, the technology learns a pattern instantaneously and autonomously and does not need to be trained with millions of samples.

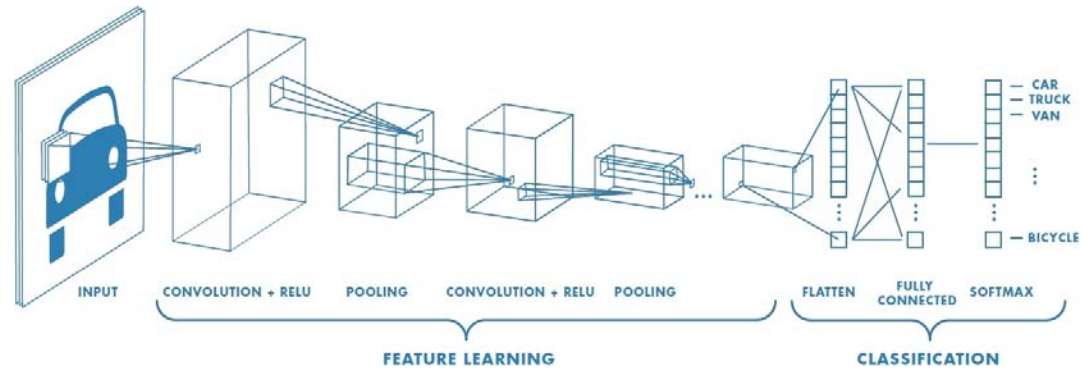
Advantages include:

- ✓ Instantaneous single-image training
- ✓ Low computational overhead
- ✓ Fast and efficient
- ✓ Lower cost, low power
- ✓ Excels at finding patterns in noisy environments

Artificial Neural Network Type Comparison

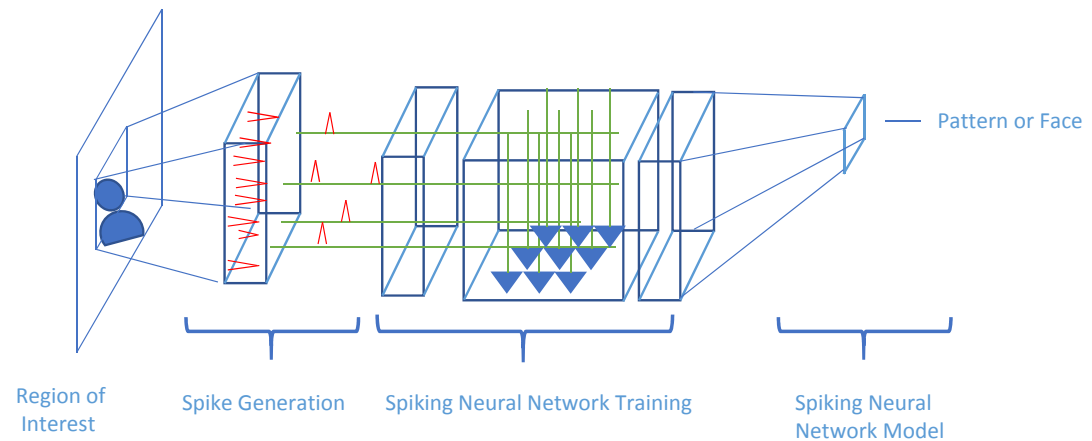
Convolutional Neural Networks

	Characteristic	Result
Computational functions	Matrix Multiplication, ReLU, Pooling, FC layers	Math intensive, high power, custom acceleration blocks
Training	Supervised Training with backpropagation	Requires large pre-labeled datasets, long and expensive training periods



Spiking Neural Networks

	Characteristic	Result
Computational functions	Threshold logic, connection reinforcement	Math-light, low power, standard logic
Training	Multiple	Instantly train in the field under real-world conditions

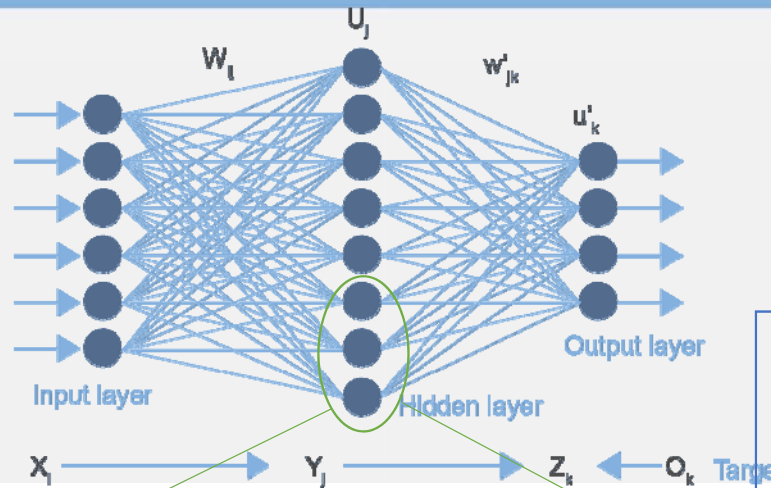
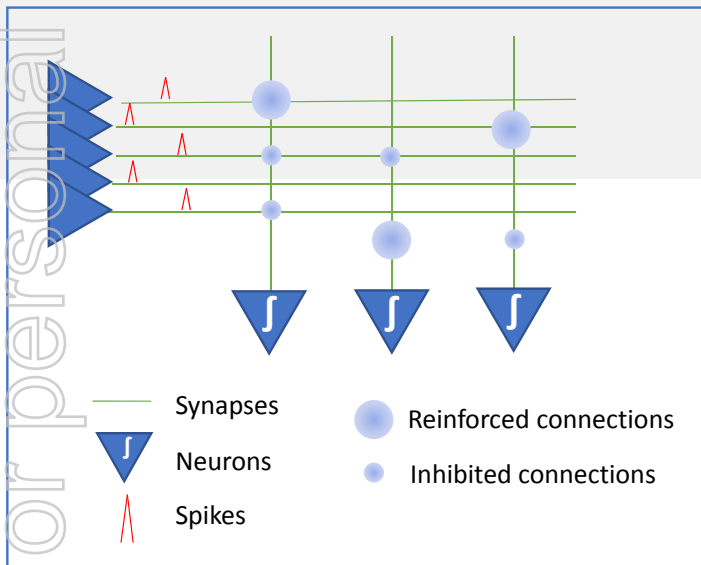


Artificial Neural Network Types for Primary Compute

Spiking Neural Networks

Low Power

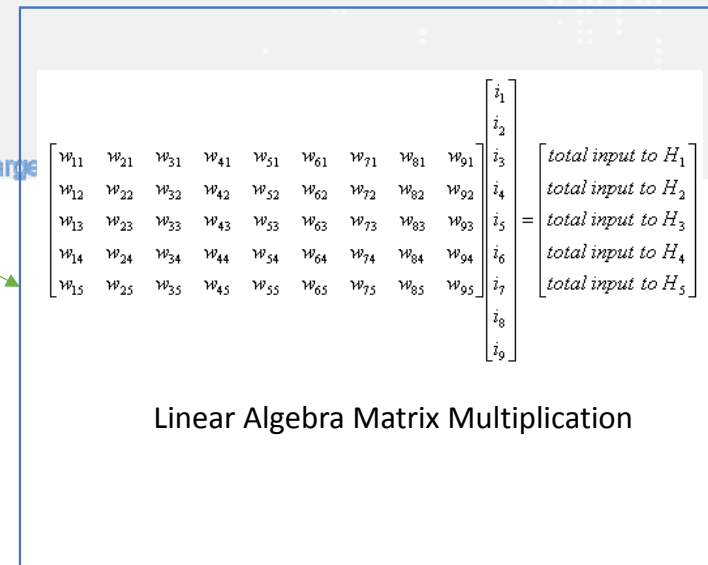
Ideal for Edge / Data Acceleration



Convolutional Neural Networks

Math intensive

Ideal for Cloud Compute



Artificial Neural Network Competitive Landscape

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Spiking Neural Networks

* Software Simulation of ANNs


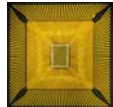
CPU 



* Off-the-Shelf Hardware Acceleration


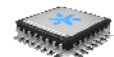
 **ALTERA**
now part of Intel

 **XILINX**
ALL PROGRAMMABLE™

* Customized Acceleration

 
TrueNorth Test Chip

 
Loihi Test Chip

 
ακίδα

Convolutional Neural Networks / Deep Learning

CPU 

Cloud Acceleration

 **NVIDIA**


 **ALTERA**  **XILINX**
now part of Intel ALL PROGRAMMABLE™


Edge Acceleration

 **NVIDIA**
TEGRA

 **ALTERA**
now part of Intel

 **XILINX**
ALL PROGRAMMABLE™


Google TPU



 Nervana™

groq

Graphcore®




Wave Computing

 **MYTHIC**

 **Horizon Robotics**

 **intel**

 **+ Movidius**

 **Cambricon**
寒武纪科技

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Markets and Products



BrainChip Product Overview

BRN has existing video analytics products on market which demonstrate SNN technology:

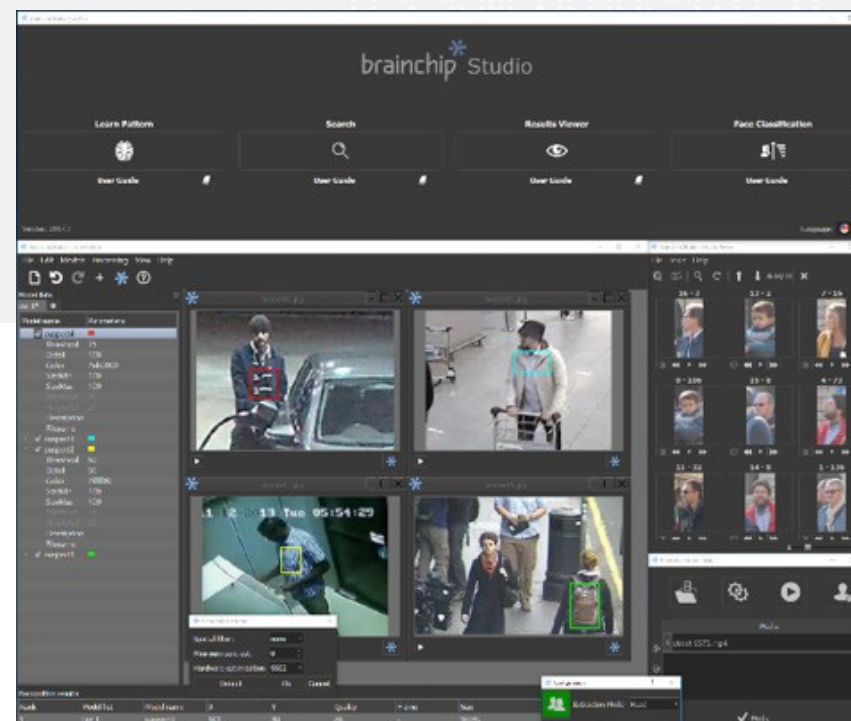
- **BrainChip Studio software was released July 2017.** BrainChip Studio aids users to rapidly search vast amounts of video footage for identifying patterns or faces. This proprietary, standardized software solution is highly scalable and applicable to a range of surveillance applications. BrainChip Studio software aids law enforcement and intelligence organizations to rapidly search vast amounts of video footage for identifying patterns or faces.
- **BrainChip Accelerator hardware was released September 2017.** BrainChip Accelerator is a complementary hardware solution that allows more rapid product deployment and generation of annuity revenues (upfront camera sales with annuity software support and maintenance revenue). BrainChip Accelerator hardware acceleration board that increases the speed and accuracy of the object recognition function of the BrainChip Studio software by up to 6 times.
- **Brainchip and Gaming Partners International Corporation (Nasdaq: GPIC) entered into a licensing, development and revenue sharing agreement in January 2018** related to the joint development of video analytic products for worldwide deployment in casino currency security, game table operations and player behaviour applications.

BRN is developing Akida™ a revolutionary Neuromorphic System-on-a-Chip general purpose processor. General Processing Unit based on a patented SNN which uses an unsupervised learning method – i.e. it can train itself to recognize patterns, search data and identify images at a much lower cost.

BrainChip Studio

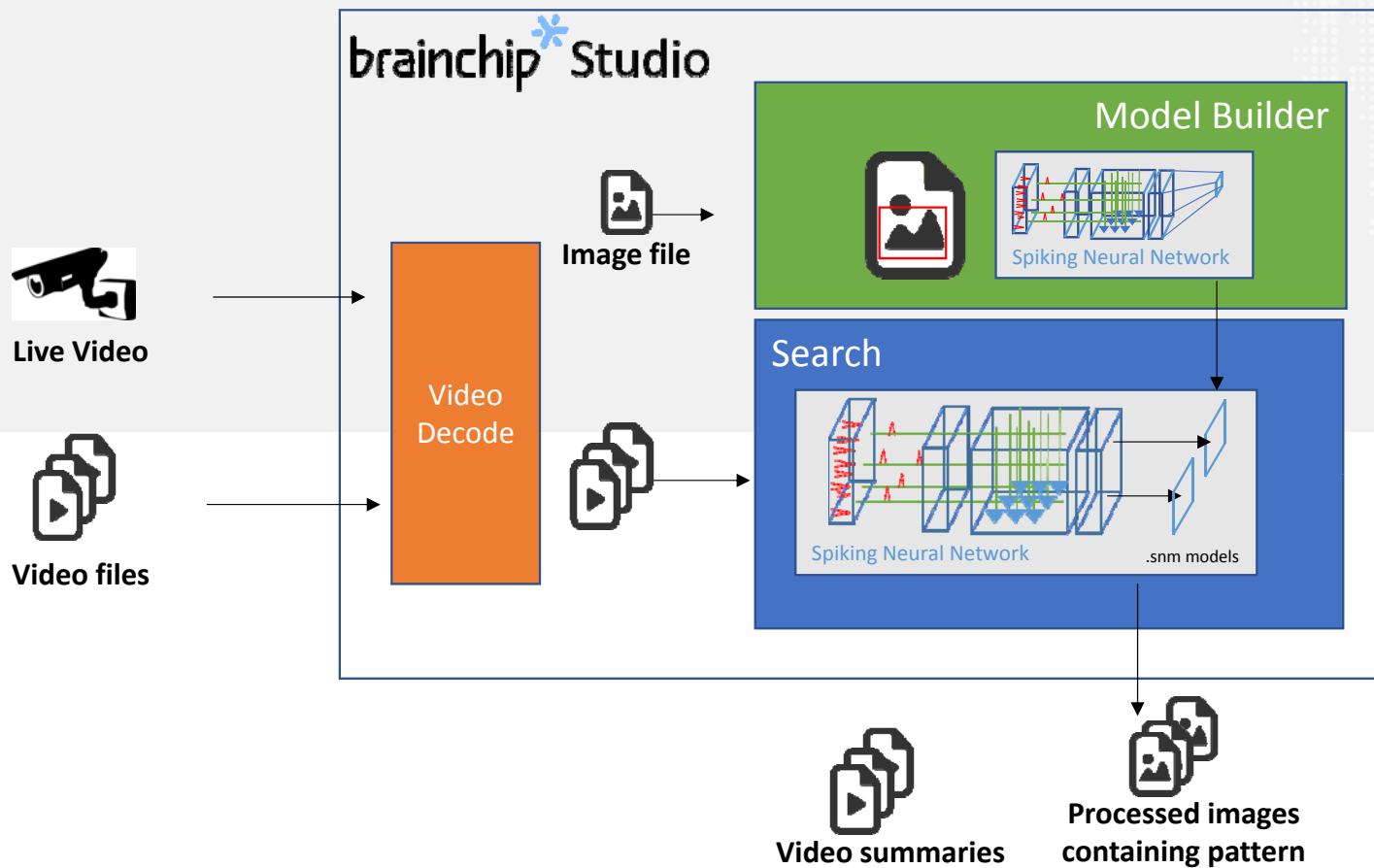
- BrainChip's **software product** aids law enforcement and intelligence organizations to rapidly search vast amounts of video footage for identifying patterns or faces.
- Because faces are potentially a uniquely identifying feature, the software includes advanced facial detection, extraction, and classification algorithms.
- The product utilizes existing video surveillance equipment and SNN means it works in low resolution and noisy environments and requires only a 24 x 24 pixel image to detect and classify faces.
- Inexpensive solution compared to prohibitively expensive approach to “classify” all video using deep learning.
- In one field trial, it detected, extracted and classified in real-time more than 500,000 facial images during 3 1/2 hours of video across eight different cameras.
- Awarded New Product of the Year in 2017 by *Security Today*

brainchip Studio



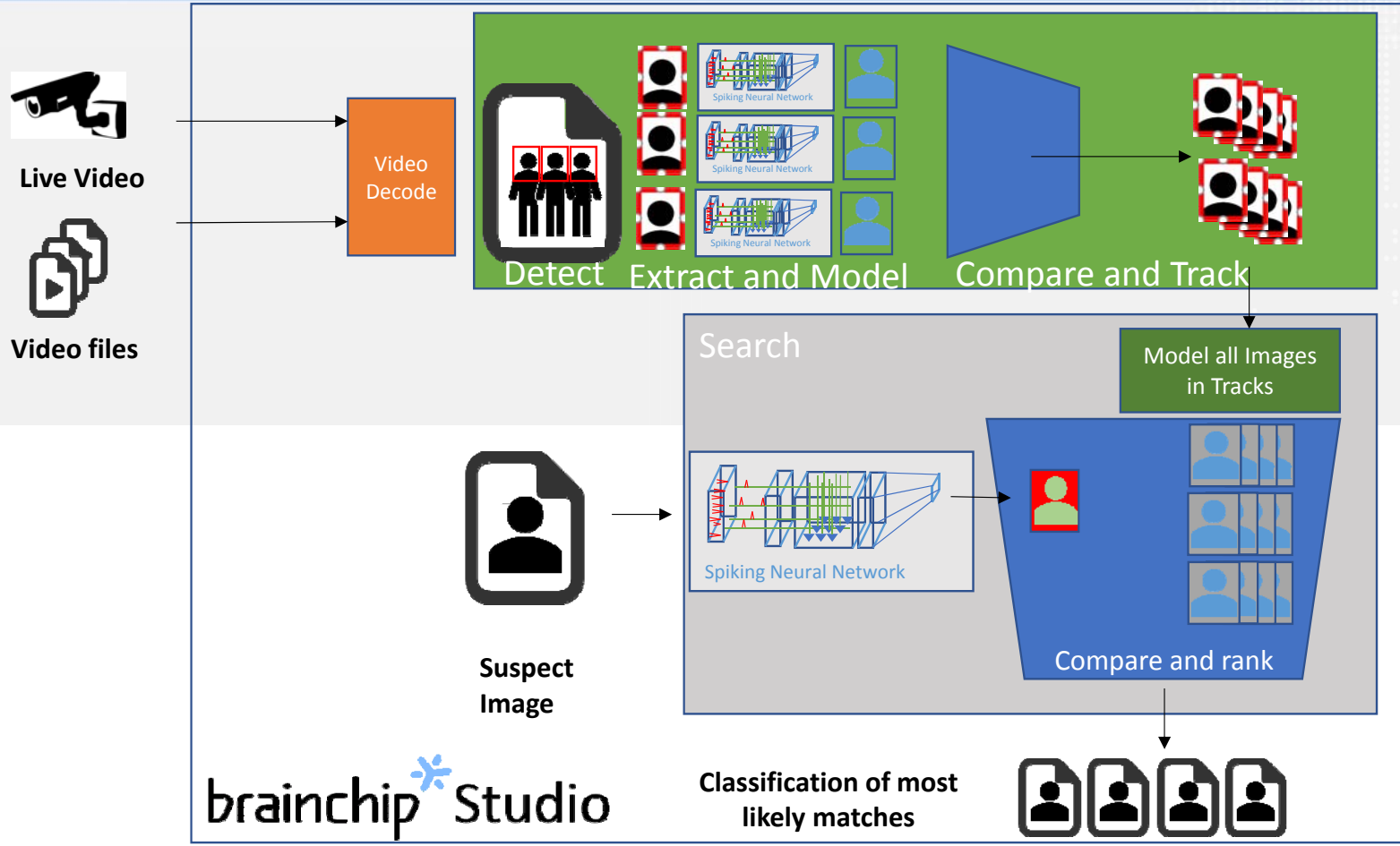
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BrainChip Studio Forensic Object Search



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BrainChip Studio Facial Detect, Track, and Classify

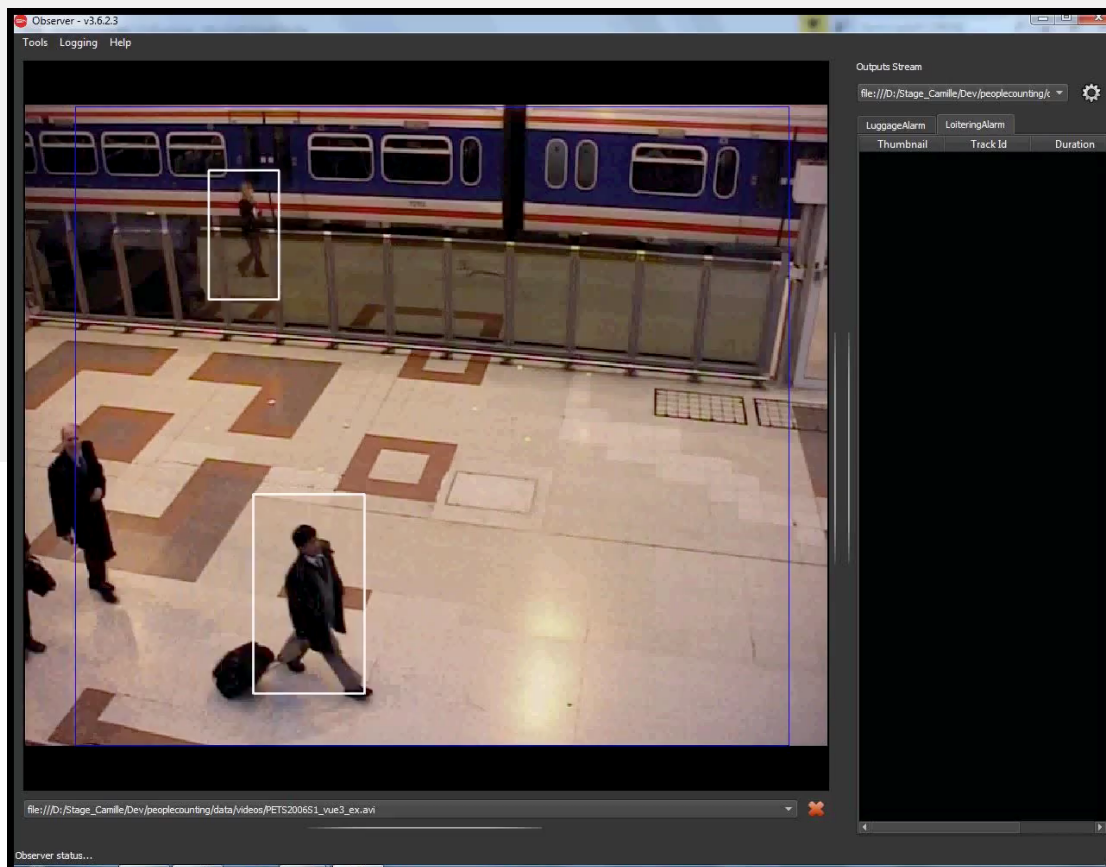


brainchip Studio

BrainChip Studio - Demonstration

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brainchip  Studio



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High-Quality Customer Base / Attractive Sales Model



Sales model:

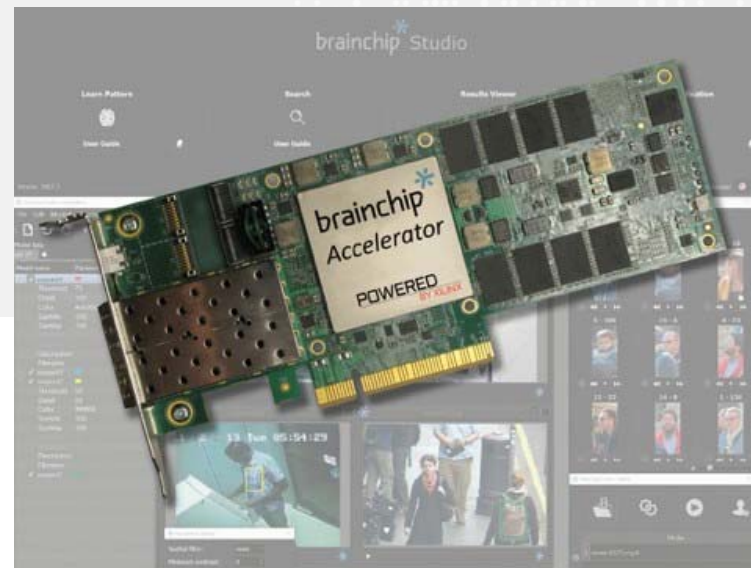
- Sell through original equipment manufacturers, integrators and other partners
- This capital efficient model is expected to accelerate sales and reduce the capital required to build a large direct sales force

Annuity-style revenue model:

- Up-front license fees (e.g. \$ per camera) and
- Annual maintenance fee or SAAS model (e.g. gaming customers are typically charged \$ per table per day)

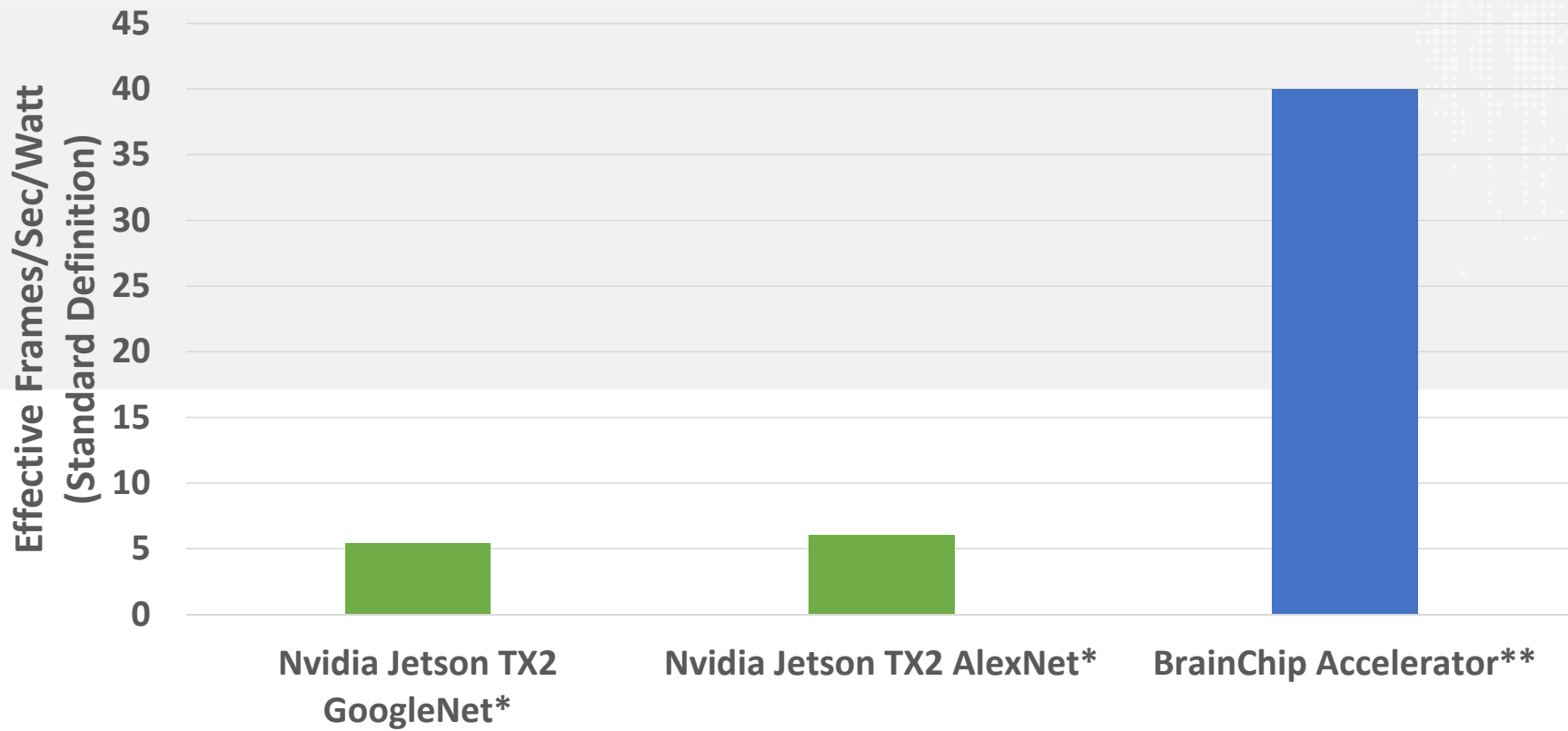
BrainChip Accelerator

- BrainChip's **hardware product** – an add-in card that increases the speed and accuracy of the object recognition function of BrainChip Studio software by up to six times, while increasing the simultaneous video channels of a system to 16 per card and is 7 times more efficient than GPU-accelerated deep learning.
- Very low-power and can be easily installed within existing video surveillance systems without upgrading power systems or thermal management.
- By processing multiple video streams simultaneously, the product enables law enforcement and surveillance organizations to search increasing amounts of video faster, with a higher probability of object recognition and lower total cost of ownership.
- The system learns from a single low-resolution image, which can be as small as 20 x 20 pixels, and excels in recognition in low-light, low-resolution, noisy environments.



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BrainChip's SNN Outperforms Leading Deep Learning Models



*NVIDIA Jetson TX2 in MQ mode, NVIDIA website, 3/7/2017, adjusted for SD resolution

**BrainChip Accelerator, 4 models, 3 scales

Next Generation Acceleration In Development: AKIDA™ Neuromorphic Processor SOC

Product Description

- General Purpose Processor based upon Patented (2008) Spiking Neural Network
- Fully parallel architecture

Training Method

- Unsupervised Learning – Trains itself to recognize patterns

Specifications

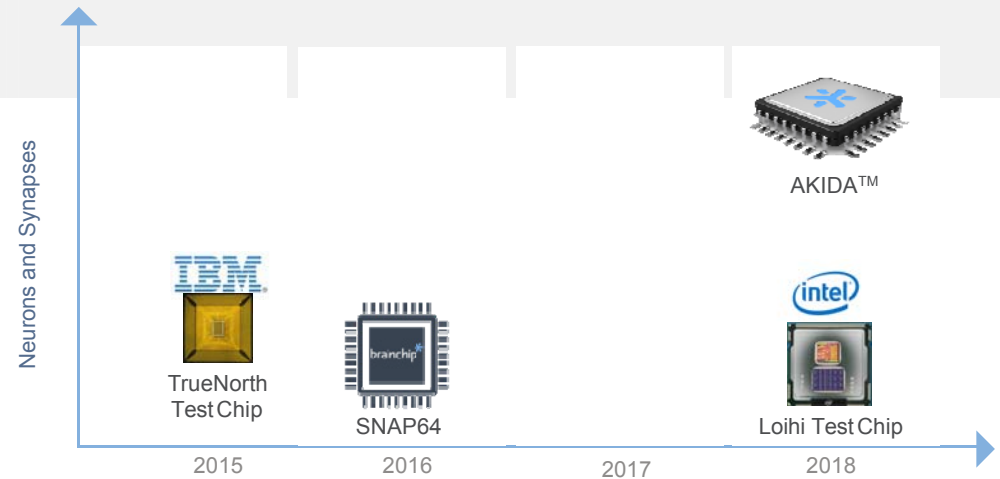
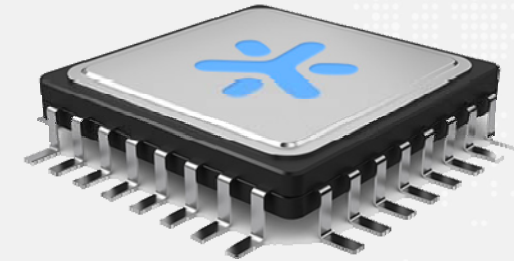
- 8x more neurons than competitive test chips
- 13x more synapses than competitive test chips
- Ultra-low power

Development Overview

- Milestones: FPGA mid 2018, Dedicated Silicon late 2018/early 2019

End Market Applications

- Surveillance & Cyber Security
- ADAS/Autonomous Vehicles
- Fintech
- Storage
- Robotics
- Gaming
- Speech & Image Recognition

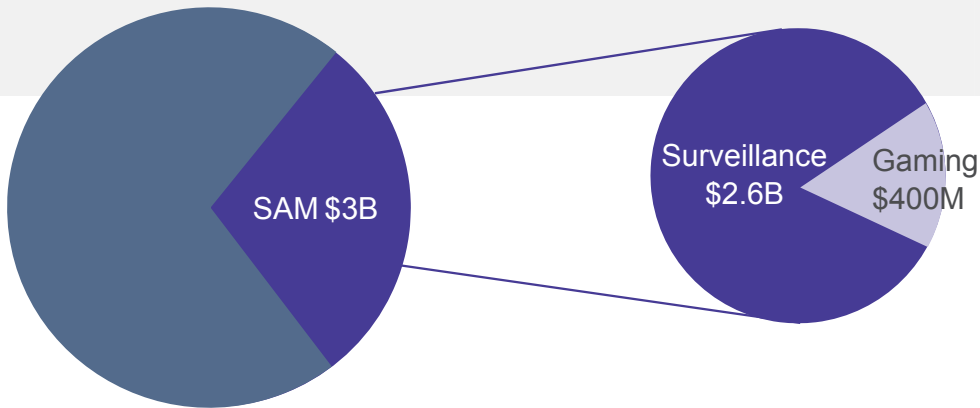


Market Size

Video Analytics – BrainChip Studio and Accelerator

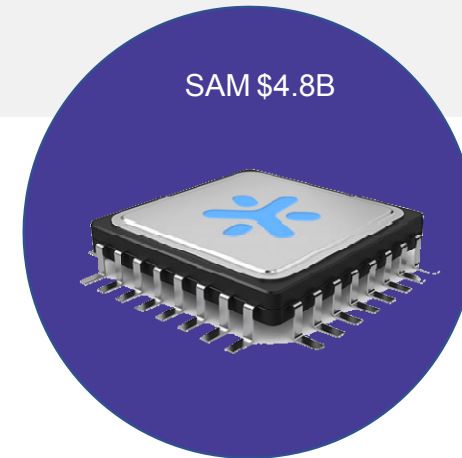
Total Addressable Market: **\$11.2B (2022)***

Serviceable Addressable Market: **\$3B****



Neuromorphic Chips – AKIDA™

Serviceable Addressable Market: **\$4.8B (2022)***
with a CAGR of 26.31% between 2016 and 2022



* Source: Markets and Markets

** Source: Homeland Market Research, Company estimates

Competitive Advantage



BrainChip

BRN's patented intellectual property protects its market position.

- The AI sector includes well-known companies like Cisco Systems, IBM, Intel, Google, Microsoft, NVIDIA, Qualcomm and Samsung, which are evolving their own versions of cognitive architectures across different platforms.
- BrainChip is a global leader in commercialization of SNN.
- To date, SNN development has been mostly within academic research institutions and not commercial.
- 1 foundational patent granted: Patent 8,250,011 – Autonomous Learning Dynamic Artificial Neural Computing Device and Brain Inspired System.
- This is the first patent (filed 2008) in the industry related to Neural Computing.
- Patent citations are accelerating a leading indicator of the value of this patent and a sign for a growing market.
- Six patents pending.

Recent Announcements and Investment Highlights



Key Recent Announcements

February 2018	Establishment of EMEA Sales Presence	<ul style="list-style-type: none"> BrainChip retains 20-year experience surveillance and video analytics veteran in Europe, Mr. Luis Coello. Addition will assist in strengthening BrainChip's market position with law enforcement and intelligence agencies across Europe.
January 2018	Agreement with Gaming Partners International	<ul style="list-style-type: none"> Companies will jointly develop video analytic products for worldwide deployment in casino currency security, game table operations and player behaviour applications. BrainChip to receive a total of US\$500,000 in license fees, a non-recurring engineering fee of US\$100,000 for products developed and long-term revenue sharing for the sale of the developed technology.
November 2017	Establishment of Australian Sales and BD Presence	<ul style="list-style-type: none"> BrainChip retains 30-year technology sales and business development veteran Mr. Gregory Ryan to lead Australian Sales and Business Development Initiative. Local presence will build upon the Company's successful engagements in Europe and the United States by addressing the regions' urgent requirements in anti-terrorism and anti-crime sought by homeland security and local law enforcement.
November 2017	Placement Raises A\$21.5 million	<ul style="list-style-type: none"> BrainChip raises A\$21.5 million in an oversubscribed share placement which was supported by a large number of institutions.
October 2017	Shipment of First BrainChip Accelerator	<ul style="list-style-type: none"> Significant milestone in neuromorphic computing as the first commercial implementation of a hardware-accelerated spiking neural network (SNN) system. Major European automobile manufacturer will evaluate BrainChip Accelerator for use in Advanced Driver Assisted (ADAS) and Autonomous Vehicle (AV) applications.
October 2017	Provision of AI Video Analytics for a Large-Scale Municipal Project in France	<ul style="list-style-type: none"> Project has a potential value of more than US\$1.2 million. Deployment encompasses over four thousand cameras across several towns and cities in France. BrainChip's technology will be used on selected cameras to protect specific high-value areas, including hospitals, schools, and first-responder sites. BrainChip Studio's object search and facial recognition capabilities was initially be deployed in 11 pilot locations during Q4 2017 and Q1 2018, with broader deployments to follow later in 2018.
September 2017	Launch of BrainChip Accelerator	<ul style="list-style-type: none"> BrainChip Accelerator increases the speed and accuracy of the object recognition function of BrainChip Studio software by up to six times Very low-power and can be easily installed within existing video surveillance systems without upgrading power systems or thermal management. Helps law enforcement and intelligence organisations rapidly identify objects in large amounts of archived or live streaming video.

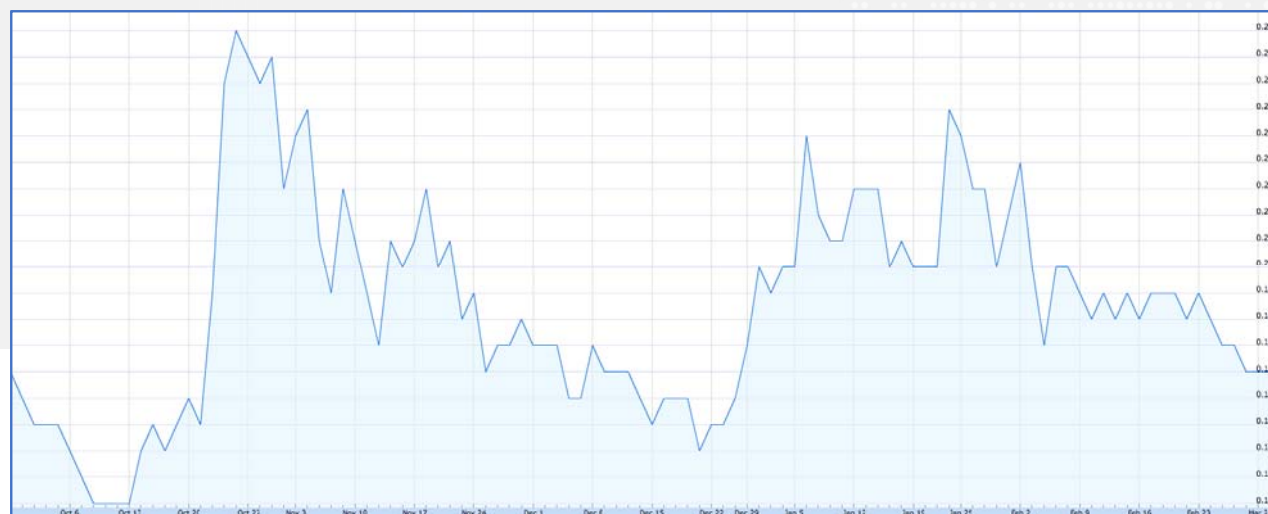
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Financial Summary

Overview

ASX Code	BRN
Market Cap*	A\$174.43M
Share Price*	A\$0.18
Capital Raised	A\$40.9M
Issued Shares**	969.1M
Cash***	US\$16.04M

Share price performance (6 months)



* As of close March 6, 2018

** Per Appendix 3B, December 14, 2017

*** Per December quarter 2017 Appendix 4C

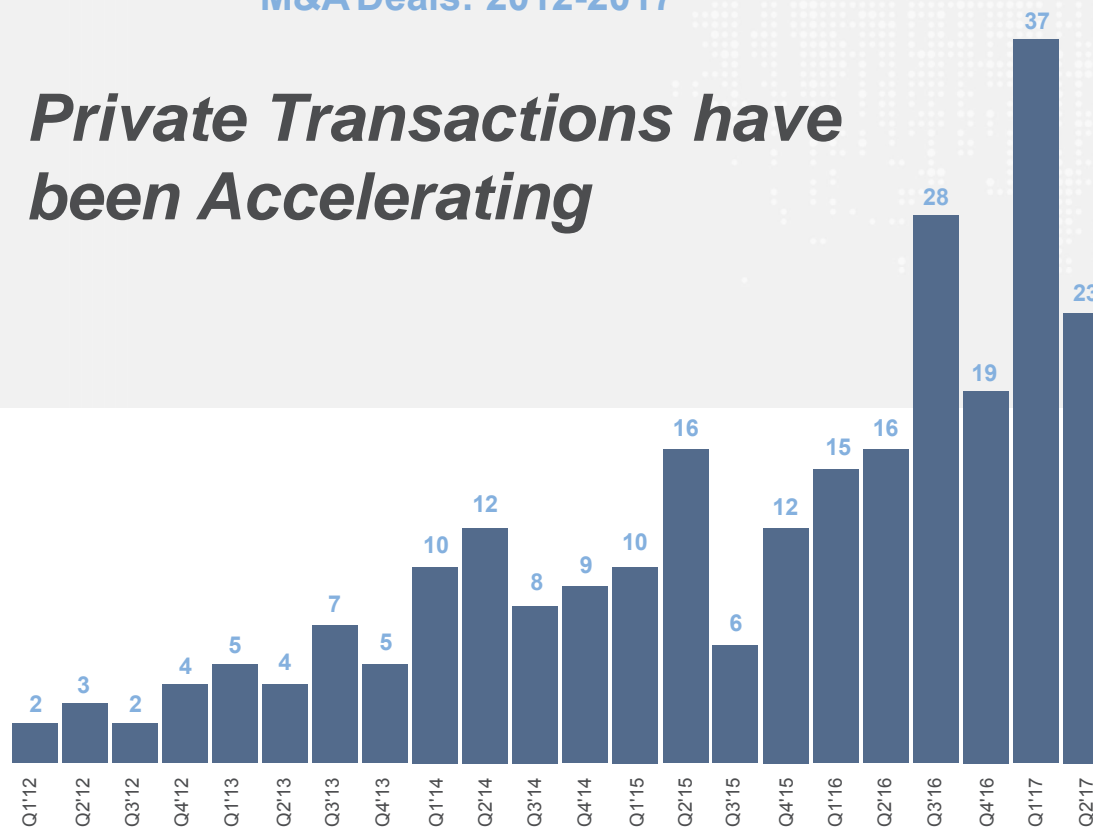
AI Landscape

- Given few pure play AI companies, M&A activity is the best indicator of valuation.
- Over 250 private companies using AI algorithms across different verticals have been acquired since 2012, with 37 acquisitions taking place in Q12017 alone.
- Baidu has been particularly aggressive in its AI acquisitions in 2017, with three M&A deals including its acquisition of Amazon Alexa fund-backed Kitt.ai in Q2 2017.
- Google is the most active acquirer of AI startups, with 12 acquisitions since 2012.
- Q1 2017 saw one of the largest M&A deals: Ford's acquisition of Argo AI for US\$1 billion.
- BRN's aim is to build the best company it can and could be bought out by another player

Source: <https://www.cbinsights.com/research/top-acquirers-ai-startups-ma-timeline/>

M&A Deals: 2012-2017

Private Transactions have been Accelerating



Investment Summary

- ✓ **Patented intellectual property** which is the result of ~10 years' development. BRN is one of the first commercial organizations globally to commercialize SNN AI technology.
- ✓ **Highly experienced management team.** CEO Lou DiNardo brings decades of tech commercialization experience and management team are seasoned Silicon Valley Executives.
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- ✓ **Multiple new growth target markets.** The technology has applications in multiple growth segments.
- ✓ **Scarcity premium.** Public market investors have few opportunities to invest in pure-play AI companies.

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Thank You

