GrAI Matter Labs

NEURONFLOW

REAL WORLD SOLUTIONS FOR LIVE AI

Ingolf Held | CEO

2019 SEPTEMBER 18

NEURONFLOW

TECHNOLOGY

Architecture Pillars

or

10x Opportunities

→ **Digital Neuromorphics**

→ **Dynamic Dataflow**

→ **In-memory Compute**

BIOLOGY BLUEPRINT FOR HUMAN INTELLIGENCE

- Highly connected 3D neurons network
- Computation in network vs ‘CPU’
- Event-based processing upon spike
- Analog processing with infinite resolution
- Communication by ‘one-bit’ spikes

DIGITAL

NEUROMORPHICS

Neuromorphic Technology Blueprint

for

Artificial Intelligence

Digital design and packet-switched connectivity
→ Repeatable, shrinkable, scalable, economic

Sparsely connected neural networks
→ Practical in silicon and most algorithms

Valued events instead of spikes
→ Established programming model

>100x
Information Transfer

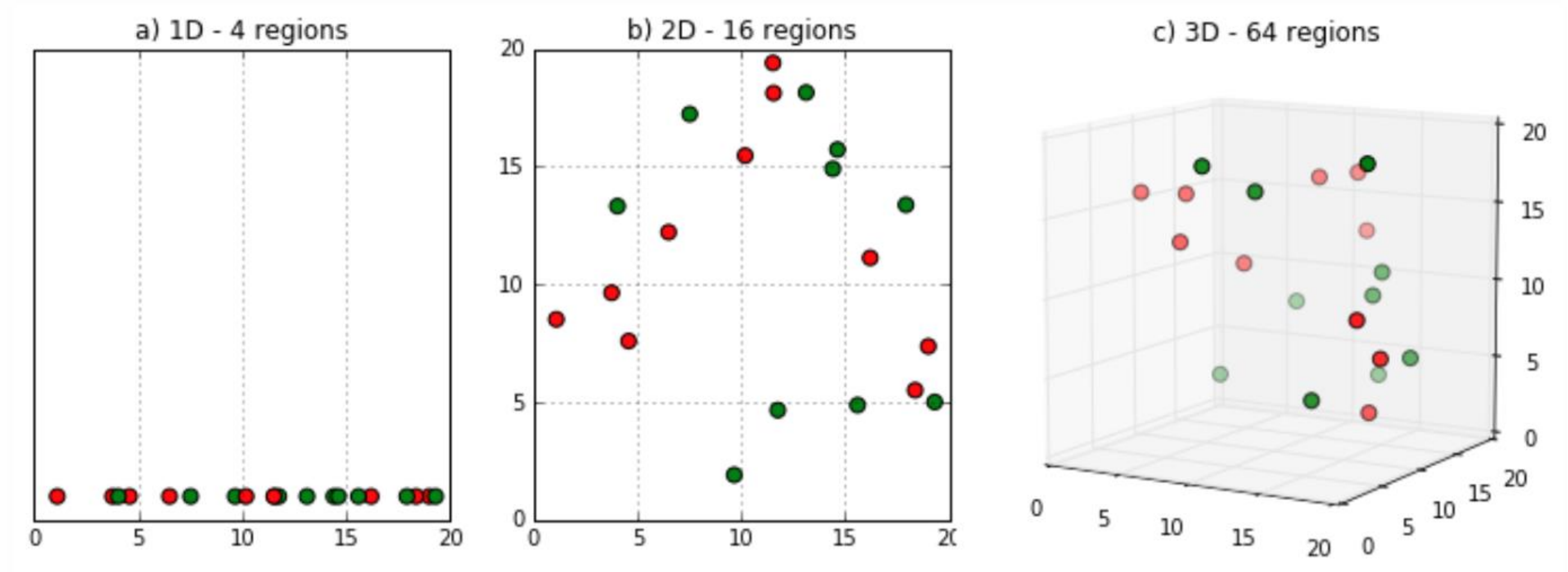
40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Cluster ID	Neuron ID	Mode	Payload

Event-Packet Format

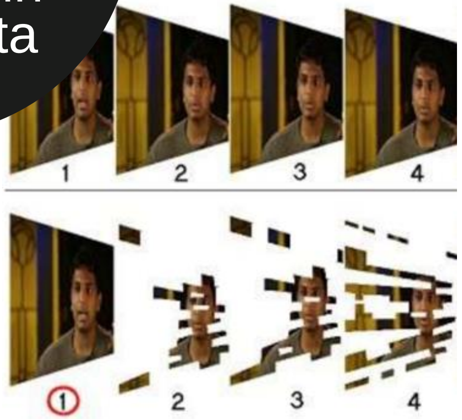
SPARSITY PRINCIPLE

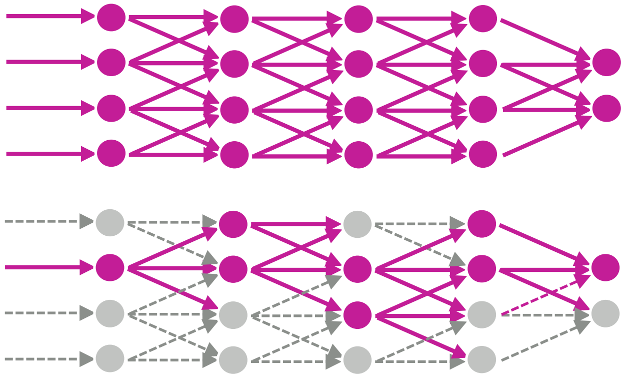
As dimensionality of data gets higher, the number of regions occupied by the same number of data points gets larger → **data gets sparser**



DYNAMIC
DATAFLOW

95%
Sparsity in Real Data





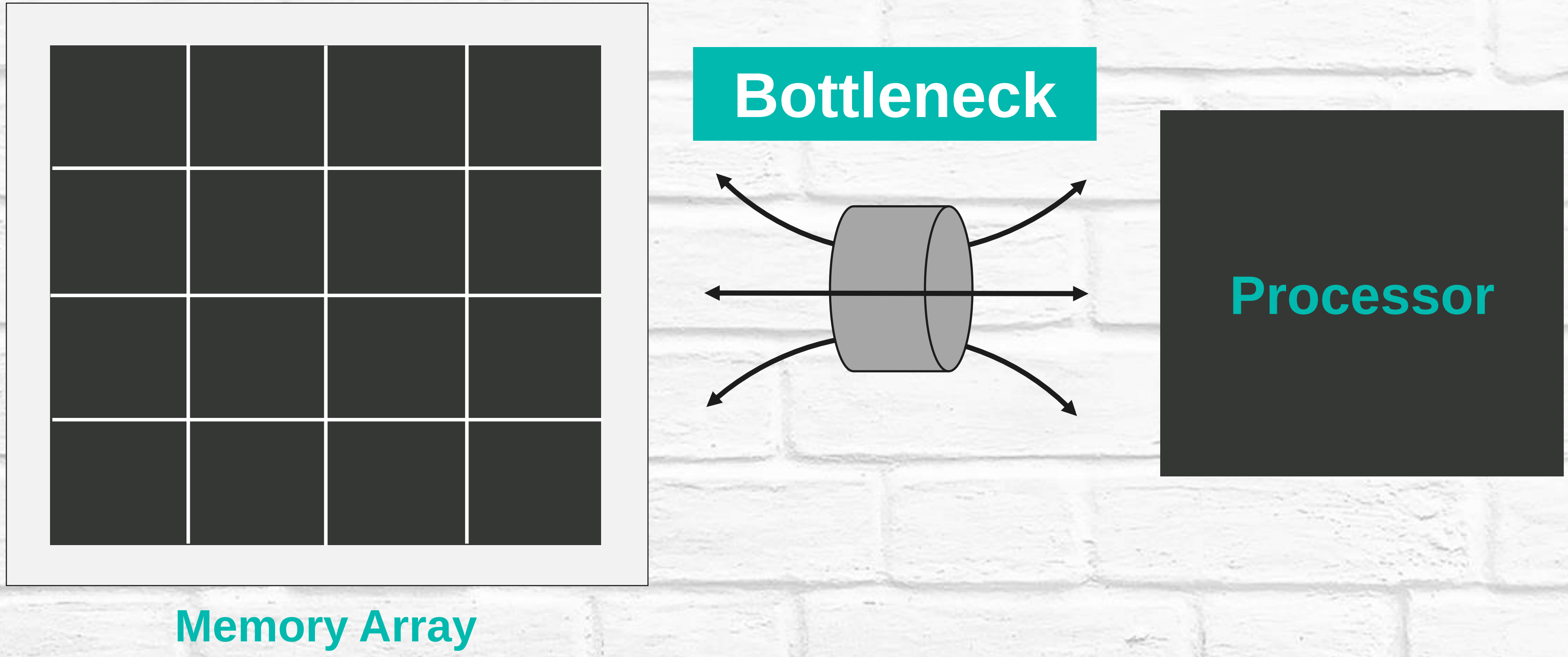
= active links and activated neurons

Only process and propagate sparse change **events**

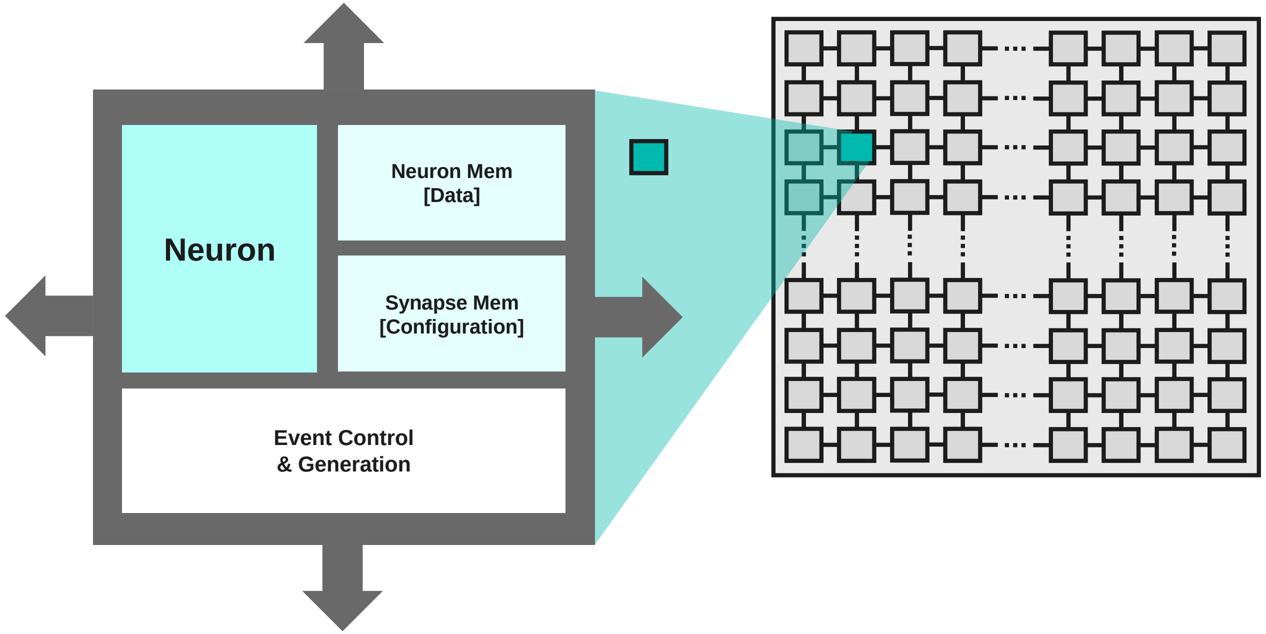
→ **Lower system latency**

→ **Lower power consumption**

Memory Wall or Von Neumann Bottleneck



IN-MEMORY COMPUTE



>10x
Memory Access
Speed

<0.01x
Memory Access
Power

Enables
scalability
to large
core counts

Enables
sparsity
via
persistent
neuron mem

AUTONOMOUS NAVIGATION

Steering control in dynamic environments

Latency

< 20μs

COGNITIVE

VOICE & VIDEO

ASSISTANT

Understanding of human speech and gestures

Keywords

Latency

< 10μs

Hand Gestures

Latency

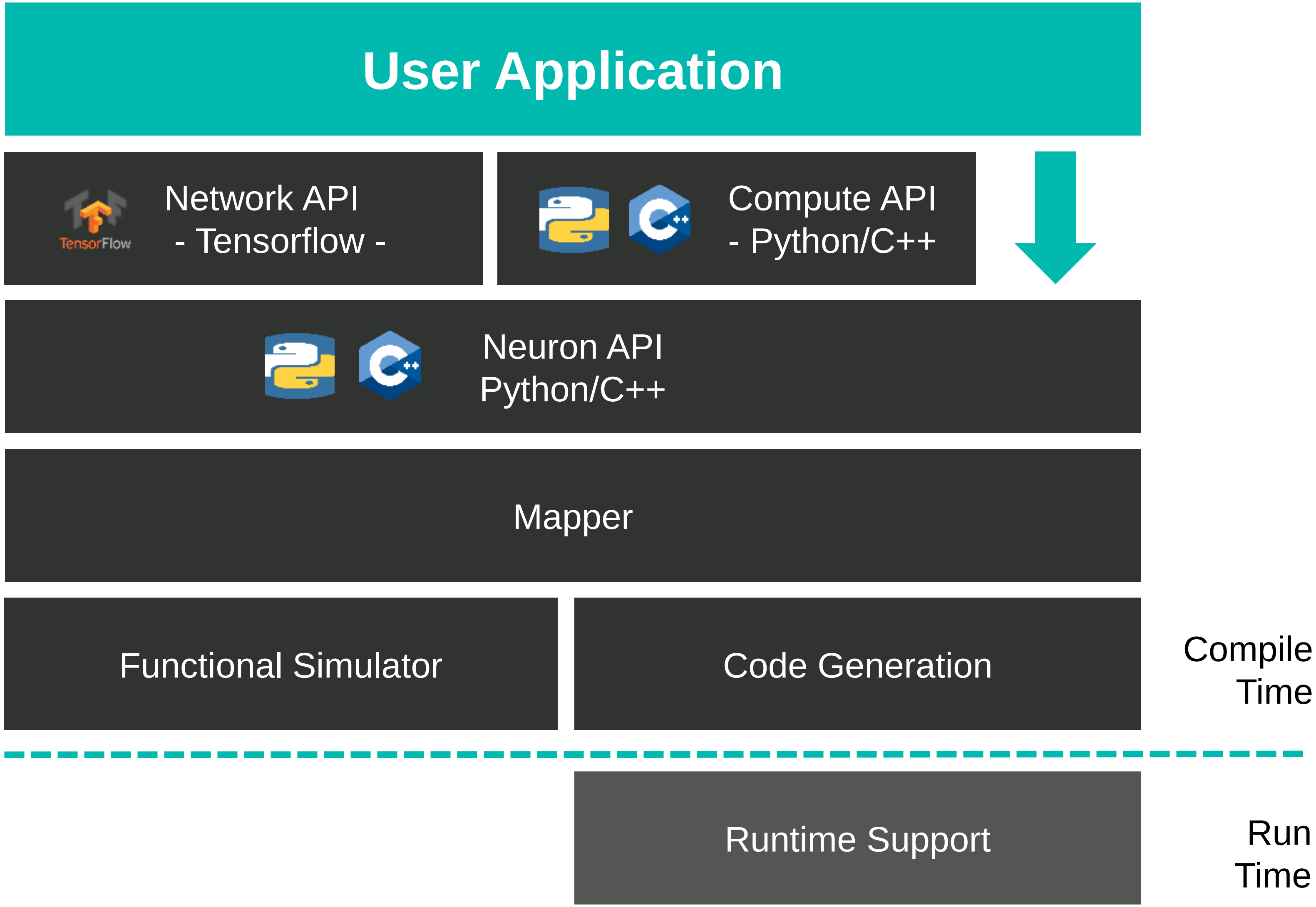
< 1μs

GrAI Matter Labs announces …

GrAIFlow

GrAIFLOW

SDK



Key Features

Conventional Programming
& Machine Learning
Direct Network Import
Integrated Simulator
Graphical Editor

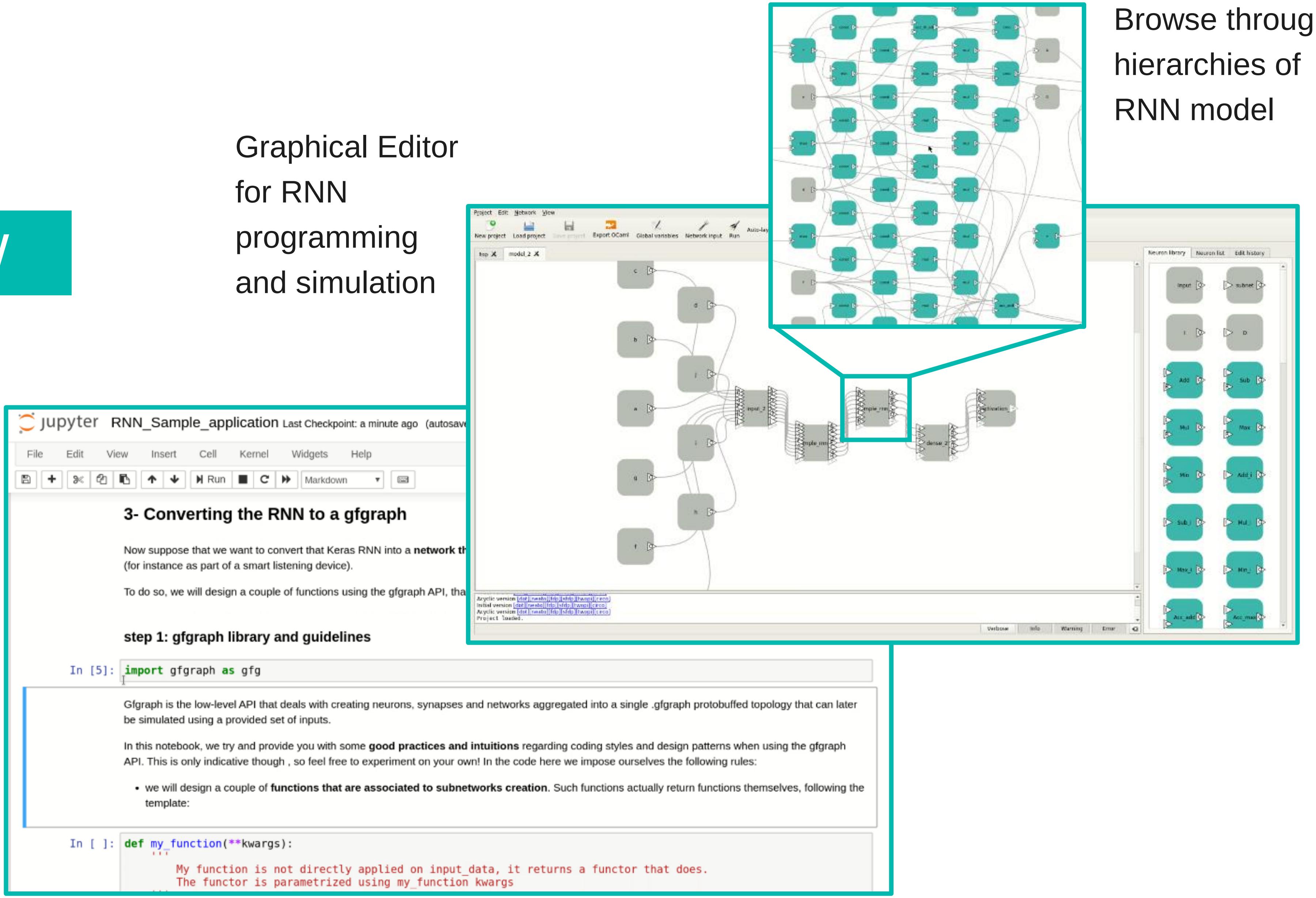
RNN

IN GRAIFLOW

Graphical Editor for RNN programming and simulation

Browse through hierarchies of RNN model

Jupyter Notebook with RNN template



GrAI Matter Labs

BUSINESS

Fabless Semiconductor

FOUNDED

2016

FUNDED

Private