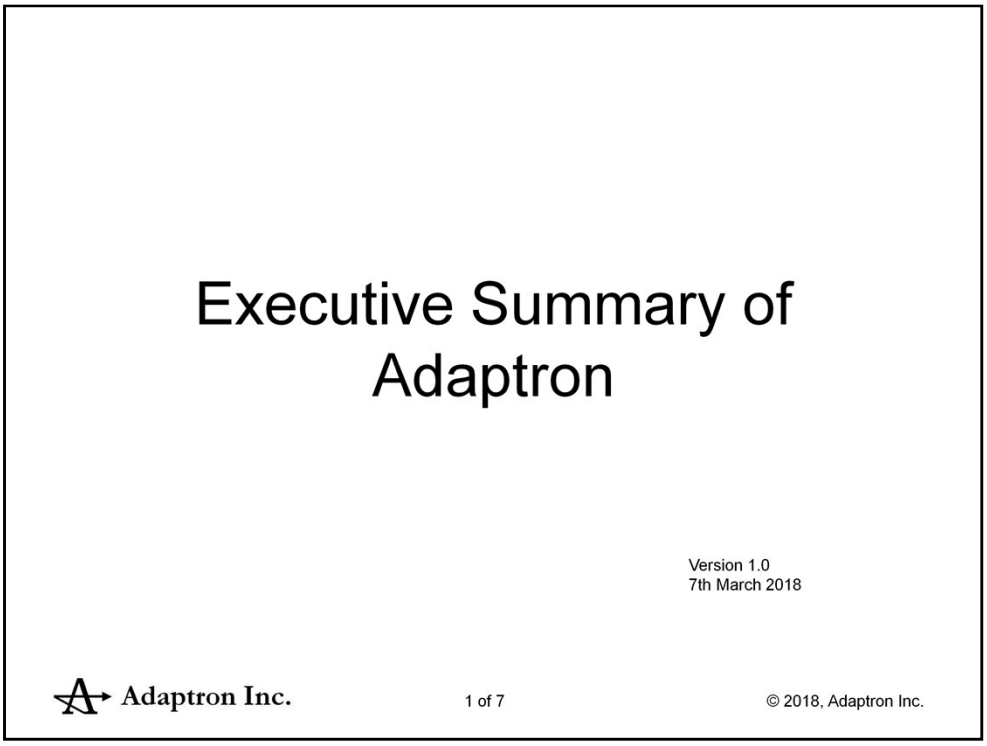
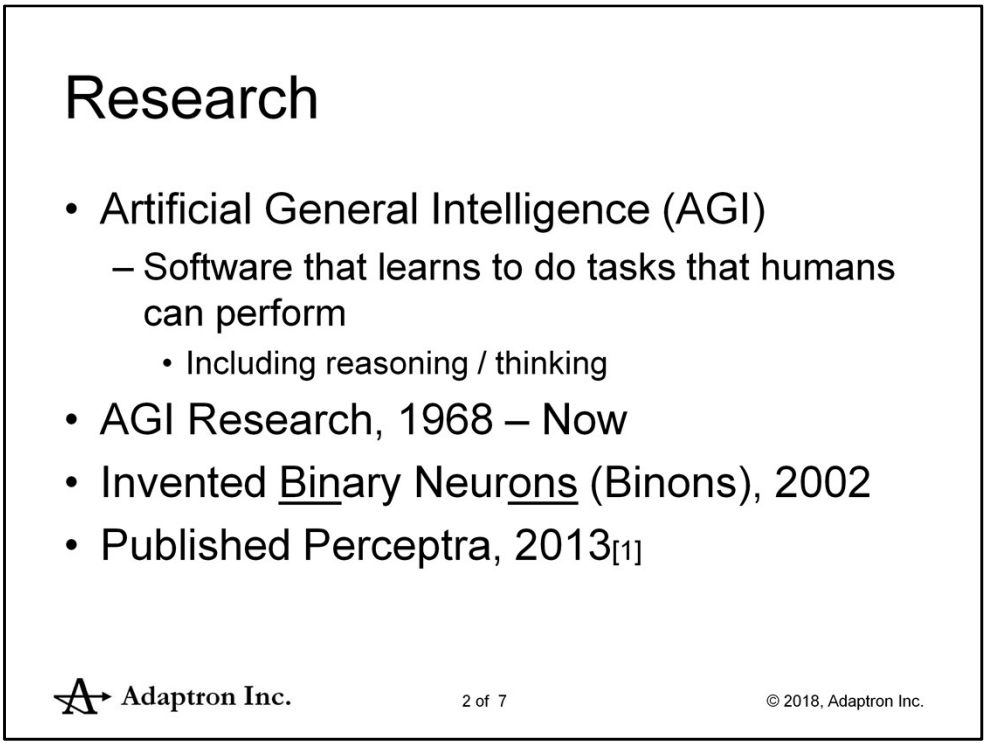



This is a short summary of Adaptron and the ground breaking Artificial General Intelligence research that I do.
Adaptron is the name for the AGI architecture and its associated software.




The company performs AGI research. Adaptron is designed to be general purpose.

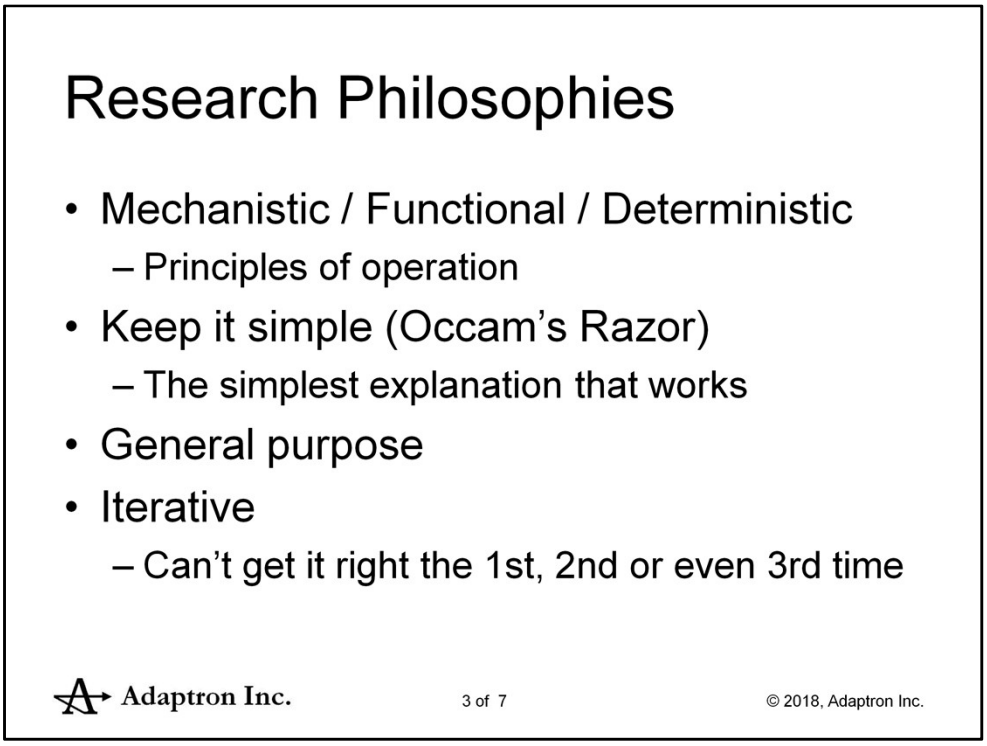
It should be able to learn to do anything a human can do.

That include recognizing things, performing tasks and learning how to think.

It was started as a hobby in 1968. It became more focused in 2002 when I invented binons and

founded the company to take advantage of the Canadian SR&ED tax credit.

The ultimate objective is to develop software that can be embedded in a robot to make it learn, think and act autonomously.




The operation of Adaptron is based on functional / mechanistic principles.

Deterministic means avoiding stochastic functions or probabilistic explanations.

This allows for models that focus on the mechanistic aspects of how it works.

It also allows for a direct explanation of how it makes decisions.

The Adaptron model is proven in software.

Another research principle is to explain things at the simple level first.

Then add complexity because the problems need to be solved at the lowest level of detail.

Solutions must be general purpose so they can learn and think given any combination of senses and action devices.

This is research. Not everything I have discovered is correct.

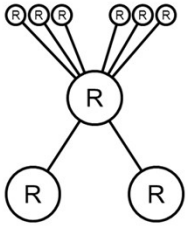
There are guaranteed to be mistakes and things that are wrong.

The processes of general purpose learning and thinking are too complicated to get right the first, second or even third time.

So one keeps on reading, theorizing, and experimenting.

# Hierarchical ANN

- Growing Artificial Neural Network (ANN)
  - Deep Learning architecture
- Simplest possible node – two input links
  - Binary neuron → binon
- No weights on links
- No probabilities
- Nodes contain ratio values
  - Relationships between things







Adaptron uses a deep learning hierarchical ANN.

Unlike most current deep learning ANNs this one continues to grow (adds new nodes) as it learns (evolves).

Its based on the simplest possible node – a binon.

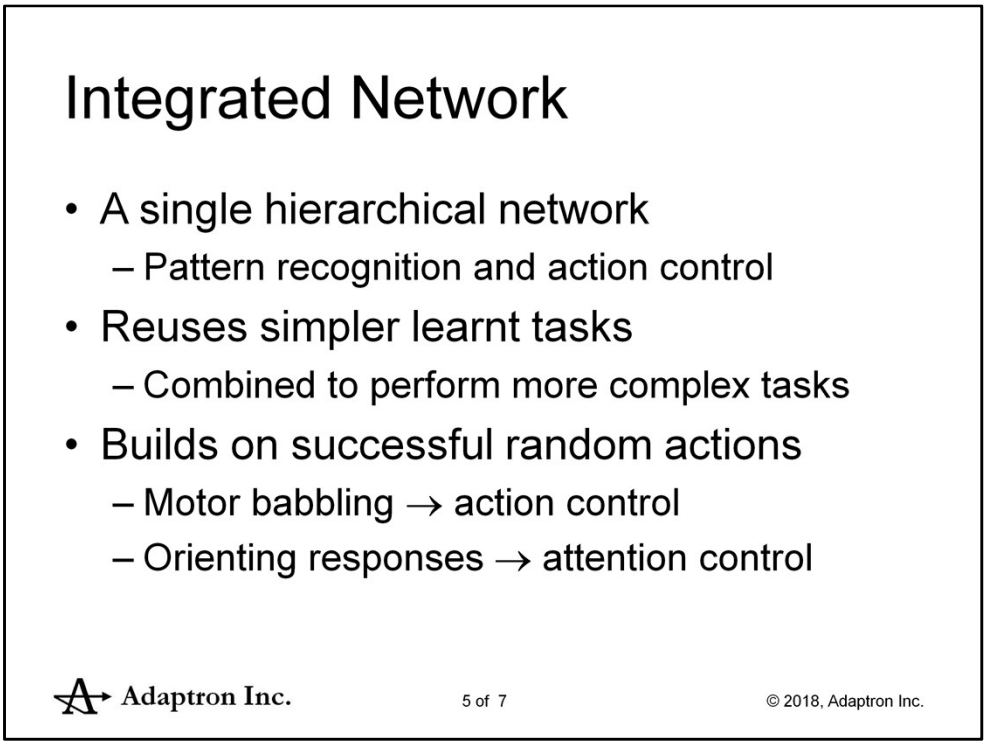
Binons represent things that are recognized or actions that are performed.

They are combined in a growing multi-level tree structure which reuses lower level binons to form more complex binons.

It differs from many such deep learning architectures in that it has no weights on the links and makes no use of probabilities.

This allows one to explain exactly how it makes decisions and behaves.

However the binons contain ratio values that represent relationships between things.



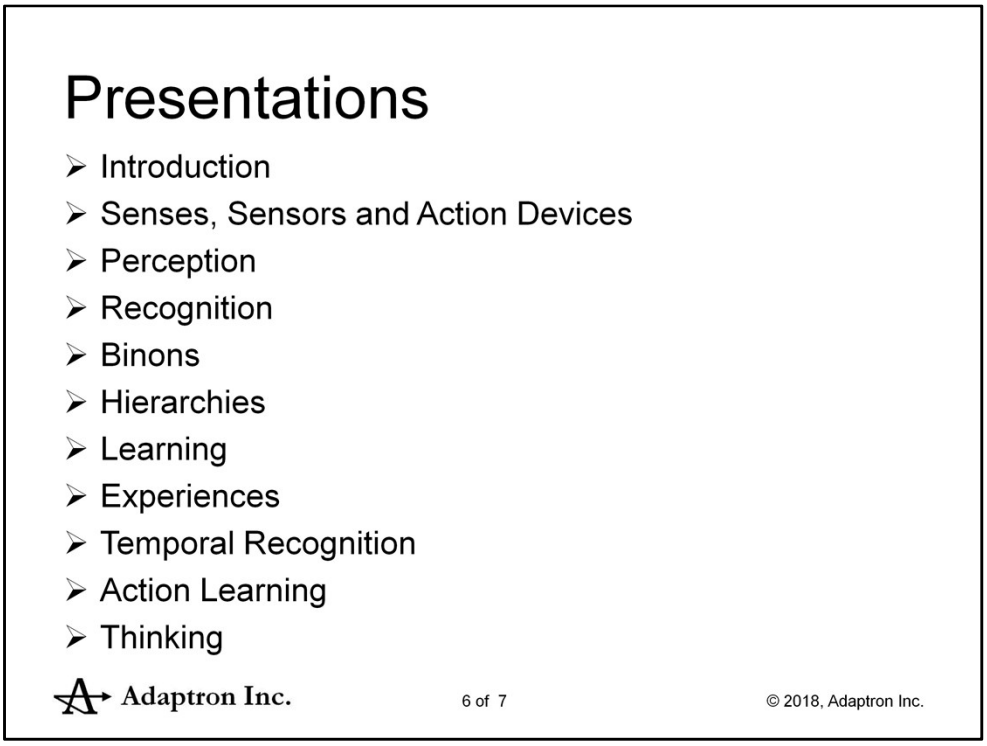

The ANN is an integrated hierarchical network of nodes that is used for both perception (pattern recognition) and action (motor control).

The simpler tasks are learnt first and represented at the lower levels of complexity in the ANN.

Then these previously learnt recognition and motor tasks are combined to perform more complex tasks at higher levels in the hierarchy.

Action control is learnt from motor babbling.

Controlling attention is learnt from reflexive orienting responses. This could be called attention babbling.




Summary of the 11 presentations as they are currently planned.

- 1. The Introduction is an overview of the other 10 presentations. This includes Adaptron's requirements, and the subjects of habits and motivation.
- 2. Senses, Sensors and Action Devices provides a mechanistic explanation of senses and action devices
- 3. Perception introduces the Gestalt laws of grouping, and other principles of perception such as: obscured and ambiguous things, and objects versus patterns.
- 4. Recognition deals with the what, where and when for recognizing things. And it describes the fundamentals of patterns and how to represent them.
- 5. The Binons presentation explains how binons are structured to represent spatial and temporal patterns.
- 6. Hierarchies describes three binary networks. The recognition-action tree of binons for recognizing spatial and temporal patterns, The Configuration Tree of senses, sensors and action devices and the Activation Tree for maintain the current state of Adaptron's behaviour.
- 7. Learning introduces the topics of recognition habits, action habits and thinking habits. It explains how the hierarchical neural network of binons grows and learns. It provides numerous examples of how binons are combined to represent an object's properties.
- 8. Experiences describes the binon activation tree that maintains the dynamic state of binons as they are used in recognition and it describes the representation of the configuration tree of senses, sensors and action devices.
- 9. Temporal recognition describes how temporal pattern recognition can be done using state based binons and spiking impulses.
- 10. Action Learning explains how the growing and integrated recognition-action tree of binons uses babbling and practicing to learn action habits. It goes into detail about how the wave of activation travels through the network.
- 11. Thinking describes how a separate binon network is used for the recollection of experiences, which produce thoughts, how decisions are made and how mental babbling is used in learning to think.

# References

[1] Martensen, B. N. (2013). Perceptra: A New Approach to Pattern Classification Using a Growing Network of Binary Neurons (Binons). In R. West & T. Stewart (eds.), Proceedings of the 12th International Conference on Cognitive Modeling, Ottawa: Carleton University.

[2] NeuraBASE by Neuramatix Sdn Bhd - http://www.neuramatix.com/bigIdea.php

[3] Hercus RG (2009) Neural Network with Learning and Expression Capability, U.S. Patent 20090119236

NeuraBASE, by R.G. Hercus, is an Artificial Neural Network (ANN) that uses a similar binary neuron approach to representation as Adaptron.