Spatiotemporal Models of Brain Sensemaking

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Areas of Research Interest

- Grown from brain inspired artificial intelligence:
  - ~20 years of cross-disciplinary research
  - Cresceptron, SHOSLIF, HDR, SASE, MILN, WWN
- **Brain-like sensemaking and reasoning:**
  - It is well known that
    - symbolic brain-like models are brittle when they do not fit the complex dynamic world
    - numeric connectionist models lack capabilities to reason well
  - We recently discovered mechanisms based on which brain as numeric networks make sense and reason
    - applicable to a wide variety of information types, sensory to text
    - both spatial and temporal

Unique Capabilities

- **An integrated brain model**
- **Cortex inspired enabling technology:**
  - **Dually optimal neuronal layers:**
    - **Spatial optimality: minimum representation error given limited number of computing elements**
    - **Temporal optimality: best update scheme at every time *t*, given limited training experience**
  - **Spatial mechanisms:**
    - **Most available information are irrelevant**
    - **Top-down attention: automatically pick up relevant information**
  - **Temporal mechanisms:**
    - **Detecting and recognizing spatiotemporal events**
    - **Automatically handle a series of temporal problems, such as explosion of temporal memory, time warping, temporal attention, temporal abstraction, and temporal action sequences.**

Seeking Specific Capabilities

- **A system integrator**

- **A variety of domain data**

- **Other machine processing techniques**

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