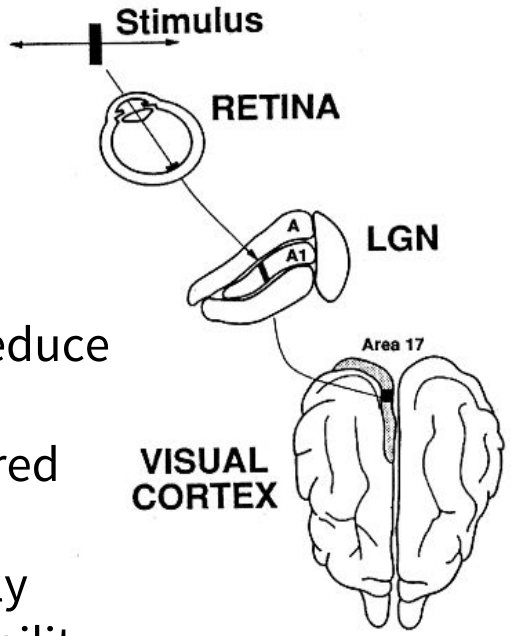
Artificial retina algorithm

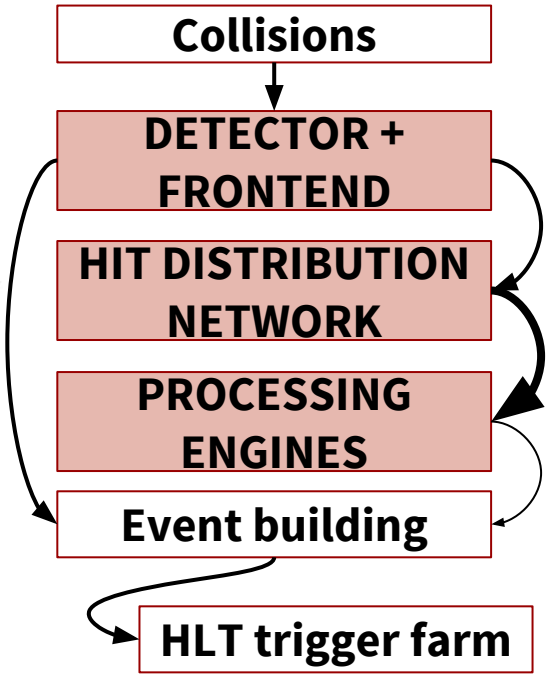
Inspired to early vision and based on:

- Voting scheme for patterns
- Template matching

Features:

- **Analog response** + interpolation reduce number of neurons/patterns
- **Resource optimization**: select stored patterns to maximize information
- **Local connectivity**: exploit spatially local correlations to increase scalability
- Conceived for **parallelism**

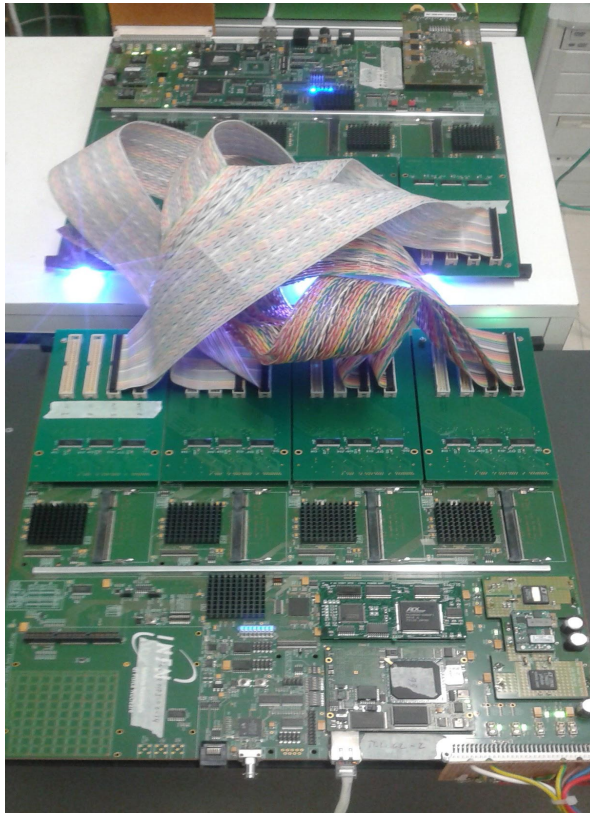




Functional prototype

Demonstrated feasibility of an “artificial retina” system able to reconstruct tracks at rates expected for LHC future upgrades

- Basic unit fully designed, simulated and run on 65nm FPGAs at nominal clock speed (160 MHz)
- Sustained event throughput of ~2 MHz with events made by 3-4 tracks
- Fully pipelined engine processing with latency ~O(100) clock cycles
- First prototype easily and cost-effectively scalable to cover a large area detector



An “artificial retina” processor for track reconstruction at the LHC crossing rate

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