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## Learning

- Tuning detectors locally to achieve global results.
- Two main types:
  - Learning internal **model** of environment (Ch 4)
  - Learning to solve a **task** (produce output from input) (Ch 5)
  - Doing both at the same time (Ch 6)

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## Problems

Simple Hebb rule:  $\Delta w_{ij} = \epsilon a_i a_j$

Weights will grow infinitely large.

Normalize by subtracting off weight.

$$\Delta w_{ij} = \epsilon a_j (a_i - w_{ij}) \quad (1)$$

What happens w/ additional receiving units in this simple system?  
They will all represent the same correlations.

Want different units to pick up on different correlations.  
kWTA allows competition.

Sims.

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## Conditional PCA (CPCA)

kWTA competition (and random differences in weights) →  
different units active for different inputs.

CPCA operates over *subsets* of inputs (those that activate a  
receiving unit).

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## Corrections

- CPCA weights don't have much *dynamic range* or *selectivity*.
- Solution: *renormalizing* weights and *contrast enhancement*.
- Quantitative adjustments – retain qualitative features of CPCA  
motivated by biology.