Computational Creativity and Machine Learning

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Defining creativity

“Creativity is the ability to come up with ideas or artefacts that are new, surprising, and valuable.”

- Boden 1992
What is computational creativity?

Computational creativity is the philosophy, science and engineering of computational systems which, by taking on particular responsibilities, exhibit behaviours that unbiased observers would deem to be creative.

- Colton and Wiggins 2012
The Opportunity for ML in CC

– A purely preprogrammed generative system
  – only does what it was told to do
  – has little if any creativity
– Adaptivity or self-determinism
  – is necessary to attribute any originality, responsibility or creative autonomy to a creative system
Four Perspectives to Creativity (MacKinnon, 1970; Rhodes, 1961)

Person, Process, Product, Press

Creativity is a complex phenomenon, characterized by many different properties
Some Possible Uses of Learning in Computational Creativity

– **Person perspective**: learn skills, develop taste, model emotions or emotional responses, …

– **Process perspective**: use generative models, solve subtasks related to adaptivity, …

– **Product perspective**: recognize what is novel, predict the value of artefacts, …

– **Press perspective**: predict reactions; generate framings
A Person/Program Perspective: Self-Reflection and Self-Control

- Artifact-awareness: what is being created
- Generator-awareness: how is it created
- Goal-awareness: why is it created
- Interaction-awareness: with whom
- Time-awareness: learning and planning
- Meta-self-awareness: awareness of being aware

Allow reflection and control over the program’s behavior in various respects
A Typology of Concept Creation

1. **Concept Extraction**: extraction and transformation from an existing but different representation

2. **Concept Induction**: learning from examples
   a) **Concept Learning**: supervised, labeled examples
   b) **Concept Discovery**: unsupervised, unlabeled examples

3. **Concept Recycling**: creative reuse of existing concepts, e.g.
   a) **Concept Mutation**: modify one existing concept, e.g., by generalization, specialization, or mutation
   b) **Concept Combination**: combine many existing concepts

4. **Concept Space Exploration**: takes as input a search space of possible new concepts
# Machine Learning Problems vs. Computational Creativity

<table>
<thead>
<tr>
<th>Machine learning problems</th>
<th>Computational Creativity problems</th>
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<tbody>
<tr>
<td><strong>Well-specified</strong></td>
<td><strong>Ill-defined, open-ended</strong></td>
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<tr>
<td>(e.g., ”induce a classifier”)</td>
<td>(e.g. ”write a poem”)</td>
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<tr>
<td><strong>Have obvious and objective success criteria</strong></td>
<td><strong>Have subjective and non-explicit criteria</strong></td>
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<td>(e.g. classification accuracy)</td>
<td>(e.g. when is a poem good?)</td>
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<td><strong>Success can be measured with relative ease</strong></td>
<td><strong>Evaluation cannot be computed easily</strong></td>
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<tr>
<td>(e.g. evaluate on test set)</td>
<td>(e.g. ask subjects to evaluate)</td>
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Thank you!