Thousands of Little Artificial Societies: Experimental Machine Ethics at Scale

Dr. Nate Kremer-Herman
Department of Computer Science
Seattle University
Experimental Machine Ethics

Ethics of artificial intelligence

Ethical issues involving use cases of and interactions with AI

Machine ethics

Considerations for how to implement ethically-behaving AI agents

Experimental machine ethics

Implementation and experimentation of ethically-behaving AI agents
Liberal Arts
- Humanities
- Formal Sciences
- Physical Sciences
- Social Sciences
- Life Sciences

Mechanical Arts
- Professional Studies
- Crafts and Trades
- Engineering
- Agriculture

AI

Ethical Agents

Observations

Digital Terrarium

Applications

Blueprints
Jeremy Bentham’s Utilitarianism as Algorithm

Algorithm 1 Bentham’s Hedonic Calculus

1: Given an action $a$ drawn from a set $A$ of available actions
2: Given a set $P$ of people most affected by action $a$
3: $utility \leftarrow 0$
4: for all $p \in P$ do
5:     $utility \leftarrow utility + (p$’s happiness resulting from action $a$)
6: end for
7: return $utility$
Why HTC is Needed for Proper Experimentation

Scale of societies

Need thousands of artificial societies as data points to draw conclusions

Long-lived societies

Some societies live for thousands of timesteps (and run for a long time)

Diversity of societies

Many options to tweak which create a diverse range of experiments
Why HTC is Ideal for this Experimentation

No dependencies between jobs

Workload is a bag of tasks

Few requirements for matchmaking

Python 3 base installation only

Other software only required at head node

GNU Make, matplotlib (optional), tk + tkinter (optional)
My History with HTCondor and OSG

First time using HTCondor and running on OSG as a proper user

Experience until now has been as middleware developer and educator

And, I certainly used it

436,235 core hours across 770,666 completed jobs since March 1, 2024
My History with HTCondor and OSG

First time using HTCondor and running on OSG as a proper user:

Experience until now has been as middleware developer and educator.

And, I certainly used it:

436,235 core hours across 770,666 completed jobs since March 1, 2024.
Zoomed in Visualization of the Bag of Tasks

Bag of tasks structured using the Makeflow workflow management system

github.com/cooperative-computing-lab/cctools
A Story of Ever-Expanding Command Line Options

```makeflow
makeflow -T condor -B "+ProjectName=..." tasks.mf

makeflow -T condor -J 10000 -B "+ProjectName=..." tasks.mf

makeflow -T condor -J 10000 -r 20 \
-B "Rank=mips
+ProjectName=..." tasks.mf
```
Zoomed in View of my Makeflow

CORES=1
MEMORY=4096
DISK=256

bentham12348120153.json: bentham12348120153.config sugarscape.py ...
   python3 sugarscape.py --conf bentham12348120153.config

egoistic8309086732.json: egoistic8309086732.config sugarscape.py ...
   python3 sugarscape.py --conf egoistic8309086732.config

rawSugarscape10432384791.json: rawSugarscape10432384791.config ...
   python3 sugarscape.py --conf rawSugarscape10432384791.config

altruistic82750437582.json: altruistic82750437582.config sugarscape.py ...
   python3 sugarscape.py --conf altruistic82750437582.config
Practically Puny Pain Points
Impact of the OSPool on Research Scope and Outcomes

Simply put: this research would not be possible without large-scale resources.

The OSPool has been the most straightforward path.

Heterogeneous compute looks like a difficult hurdle to clear at first glance.

Few software requirements and middleware as layer of abstraction.
Acknowledgements

Student Researchers:
Hadiya Chishti (Seattle University)
Colin Hanrahan (Seattle University)
Maria Milkowski (University of Notre Dame)
Anna Muller (Seattle University)
Mariana Shuman (University of Washington)
Abi Sipes (Butler University)

Faculty Researchers:
Nate Kremer-Herman (Seattle University)
Ankur Gupta (Butler University)

Funding Provided By:
SeattleU Undergraduate Summer Research Award 2023-24
Butler University Holcolm Award Research Fund 2023
Shameless Plug: ESP-HPC at SC24
Symposium on Ethical, Social, and Policy Issues in HPC
Friday November 22nd, 08:30-12:00

nkh@seattleu.edu
sites.google.com/view/esp-hpc (CFA open)
github.com/nkremerh/sugarscape