



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

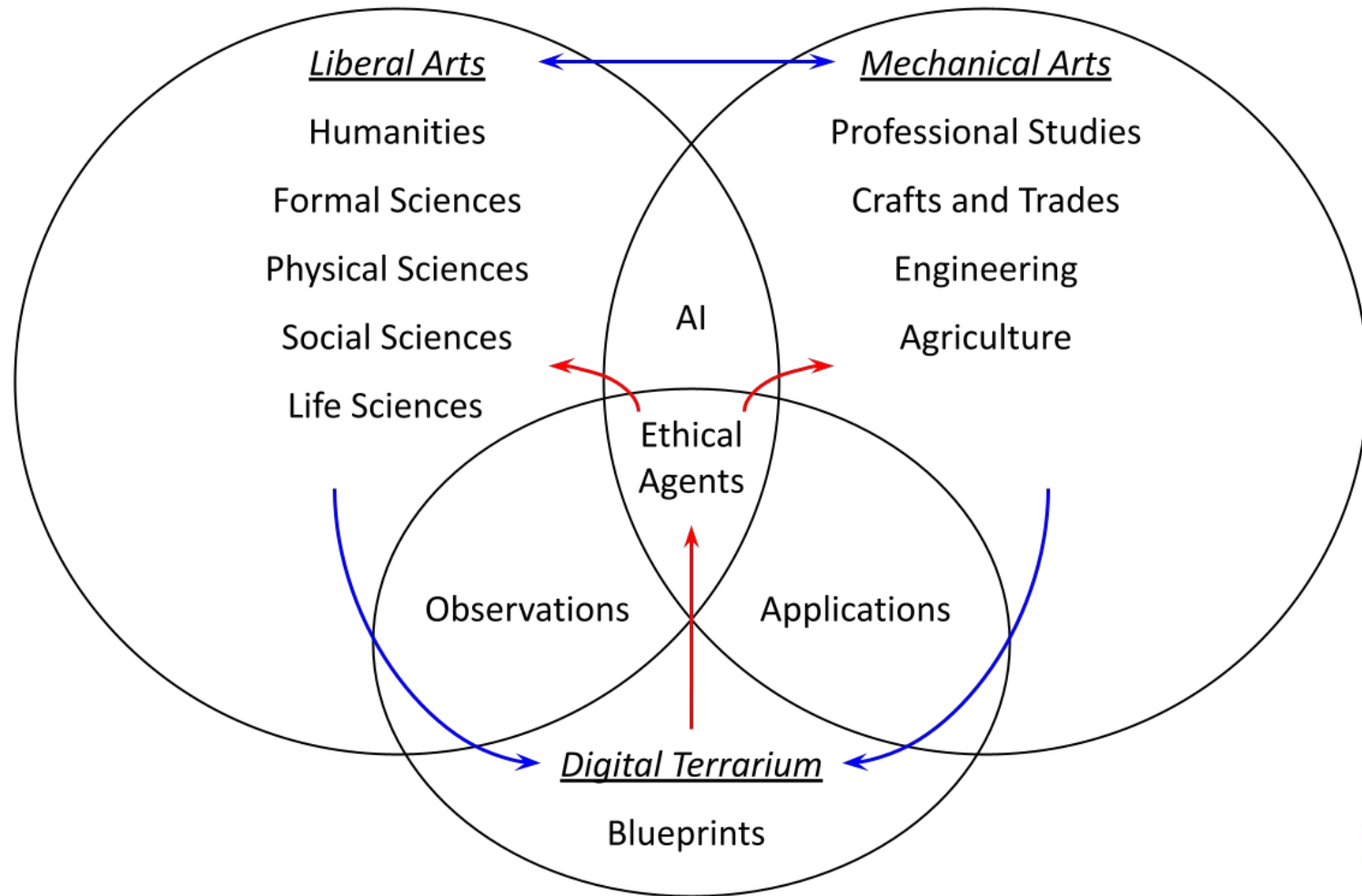
Machine ethics

Considerations for how to implement ethically-behaving AI agents

Experimental machine ethics

Implementation and experimentation of ethically-behaving AI agents

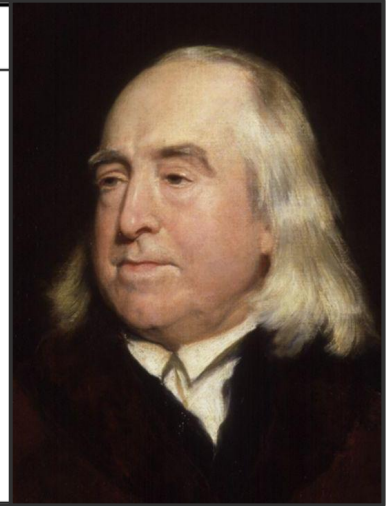


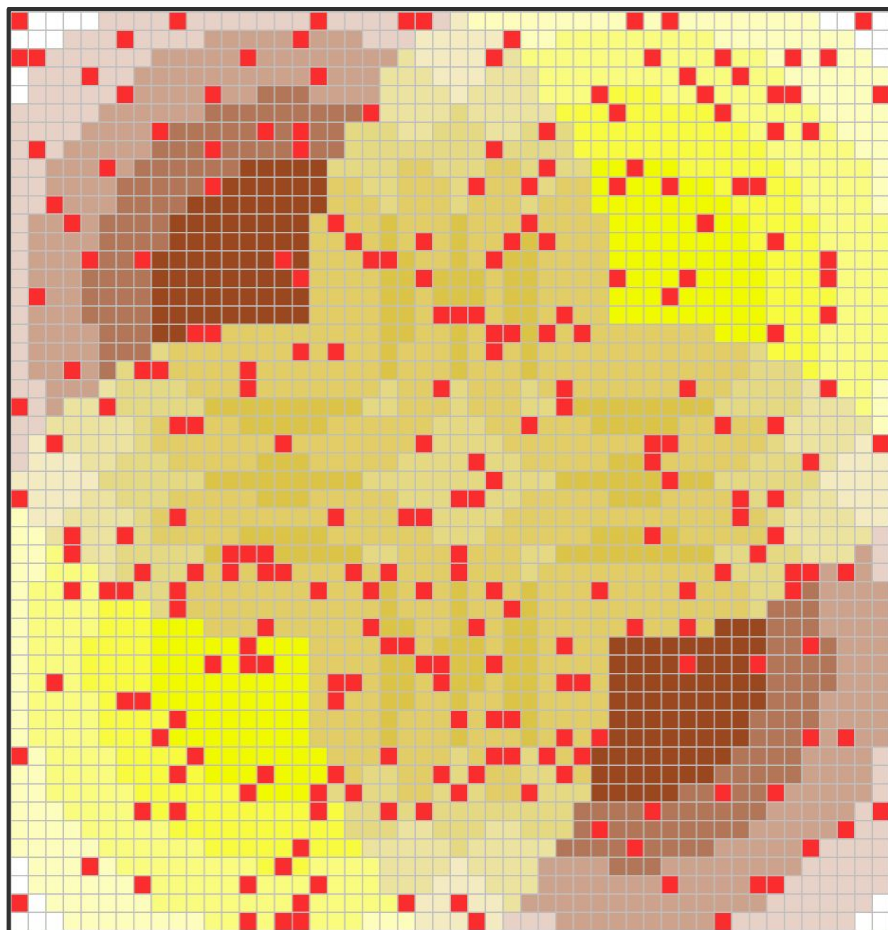


Jeremy Bentham's Utilitarianism as Algorithm

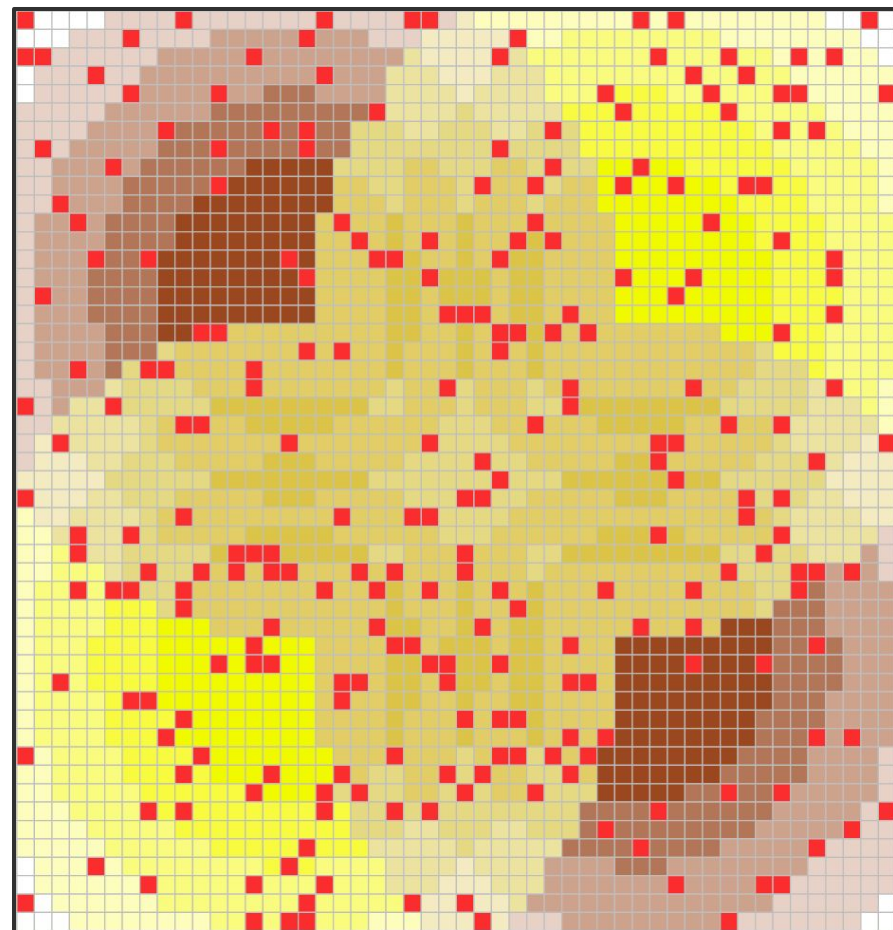
Algorithm 1 Bentham's Hedonic Calculus

- 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: $utility \leftarrow utility + (p\text{'s happiness resulting from action } a)$
- 6: **end for**
- 7: **return** $utility$





Greedy



Utilitarian

github.com/nkremerh/sugarscape

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



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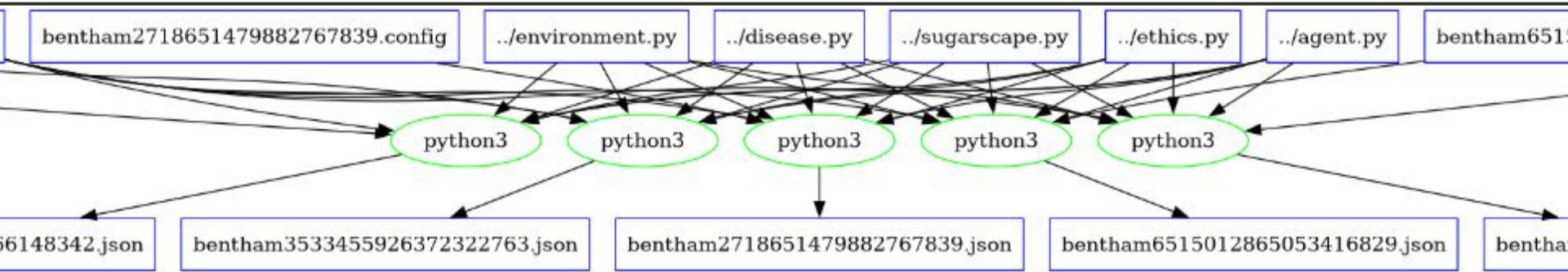
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Zoomed in Visualization of the Bag of Tasks

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 -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\n+ProjectName=.." tasks.mf
```

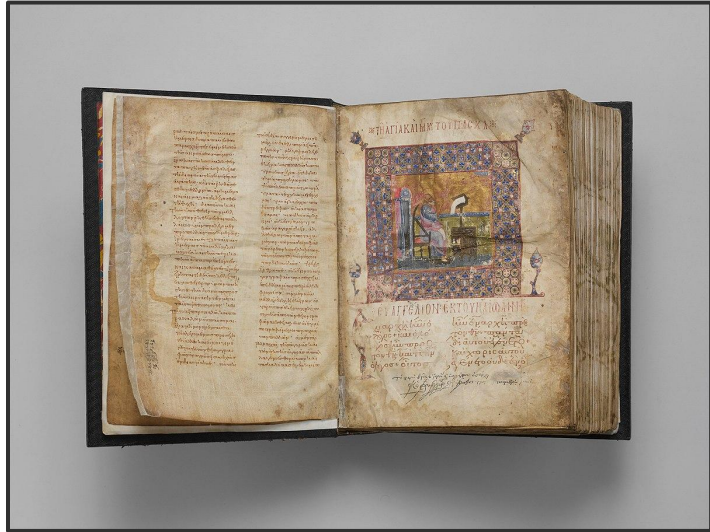


Zoomed in View of my Makeflow

```
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



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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

