

Solving General Twisty Puzzles with RL

Goal: Compute interpretable solutions on consumer hardware

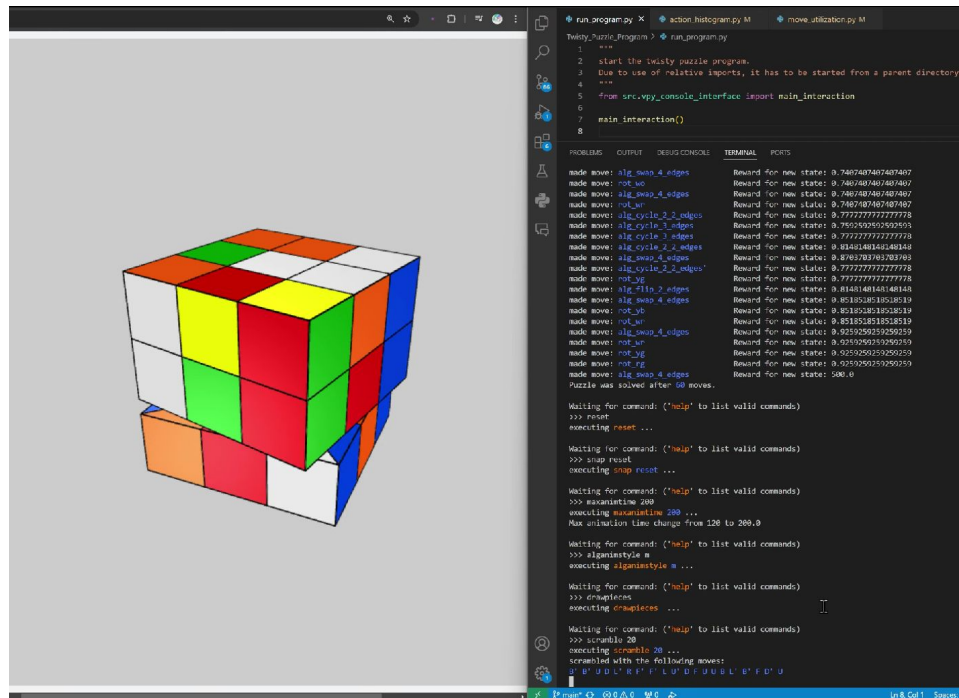
Methods:

- Automatic action space augmentation
- Dense, intuitive rewards

Result:

- 100x faster training than previous RL-approaches
- AI solutions similar to human ones

Time: ~600 hours over 4 years



[Code on GitHub](#)

thesis

YouTube
explanation

Simulating real-world traffic sensor noise for more robust RL-Traffic Signal Control

Goal: Improve robustness of RL-TSC agents against noisy data

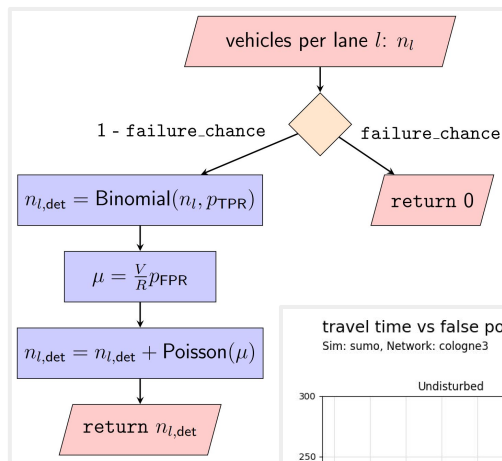
Methods:

- Simulate real-world noise
- Test >600,000 parameter settings to analyze impact

Result:

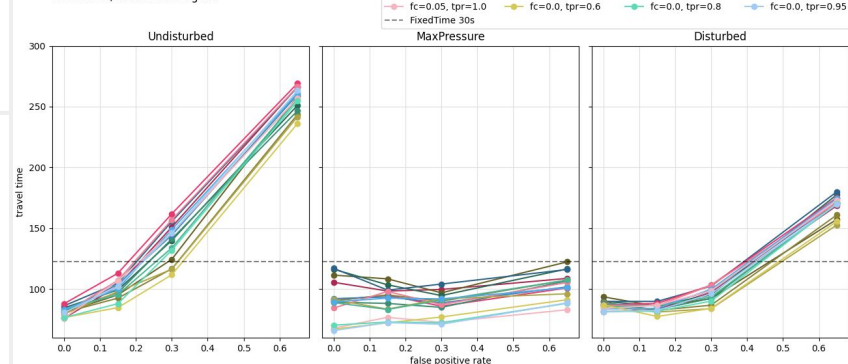
- Understanding impact of different noise types
- Actionable sensor type deployment recommendations

Time: 2-3 months



Noisy calculation of detected vehicles from actual vehicles

travel time vs false positive rate
Sim: sumo, Network: cologne3



[Code on GitHub](#)

publication planned

Custom Ticket to Ride Map Creation Tools

Goal: Efficiently create custom Ticket to Ride versions

Methods:

- Analyzed creation bottlenecks and processes
- Built tools to support creation at multiple stages

Result:

- Faster creation of variants
- High-quality custom games

Time: ~300 hours over 1 year



[Code on GitHub](#)

[result showcase](#)

Northgard Board Game with Web-UI

Goal:

- Recreate the board game Northgard digitally
- Write web-UI without prior JS/CSS/html knowledge

Methods:

- AI tools for writing frontend
- Python backend
- Custom tools for asset creation

Result:

- Prototype with responsive web-UI

Time: ~120 hours incl. asset creation



[Code on GitHub](#)

[assets](#)

[game info](#)

Simplified Saboteur Game with RL players

Goal:

- Investigate emergence of deceptive AI behaviour

Methods:

- LLM-accelerated coding

Result:

- RL-agents successfully play simplified game
- *unfinished*

Time: ~20 hours



[Code on GitHub](#)

[YouTube
demo](#)

Learning Methods in Humans, Animals and AI

Goal: Compare learning techniques in different organisms to inspire future research

Methods:

- Offered Workshop at [VANconference25](#)
- Years of following current research

Result:

- Overview helps predict industry & research direction

Time: <10 hours

Learning method	Animals	Humans	Computer (Machine Learning)
Evolution	genetic evolution	genetic evolution	genetic algorithms (e.g. NEAT)
Trial & Error	Conditioning	Conditioning	Reinforcement learning
Imitation	Orcas teaching hunting methods & language	Learning language	Supervised learning, Imitation learning
Abstract Instructions	Bee dance to describe location of food	Most of school / higher education, baking recipes	In-context learning in LLMs
Mental Simulation	Birds cracking nuts using cars, tool use	Dreams, pondering other's reactions	World models (e.g. DreamerV3)

[GitHub page](#)

Wizard Game with multiple AI players

Goal: Compare different AI techniques for creating wizard game agents

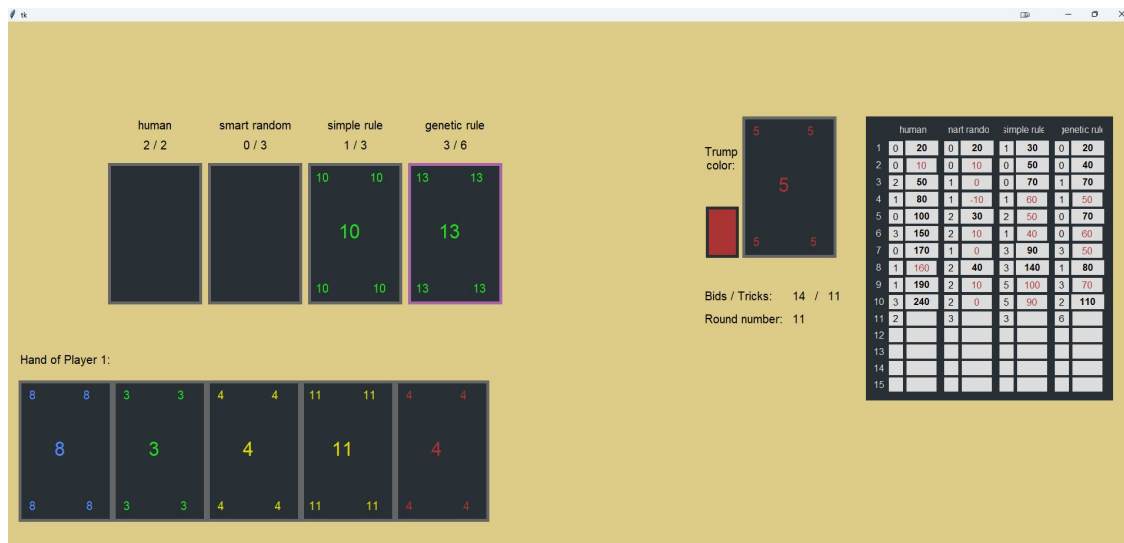
Methods:

- Rule-based AI, optimized via genetic evolution
- tkinter GUI design

Result:

- Major capability differences

Time: ~60 hours



[Code on GitHub](#)