

Firecracker: Wildfire Modeling and Leveraging AI for Strategic Wildfire Suppression



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Background

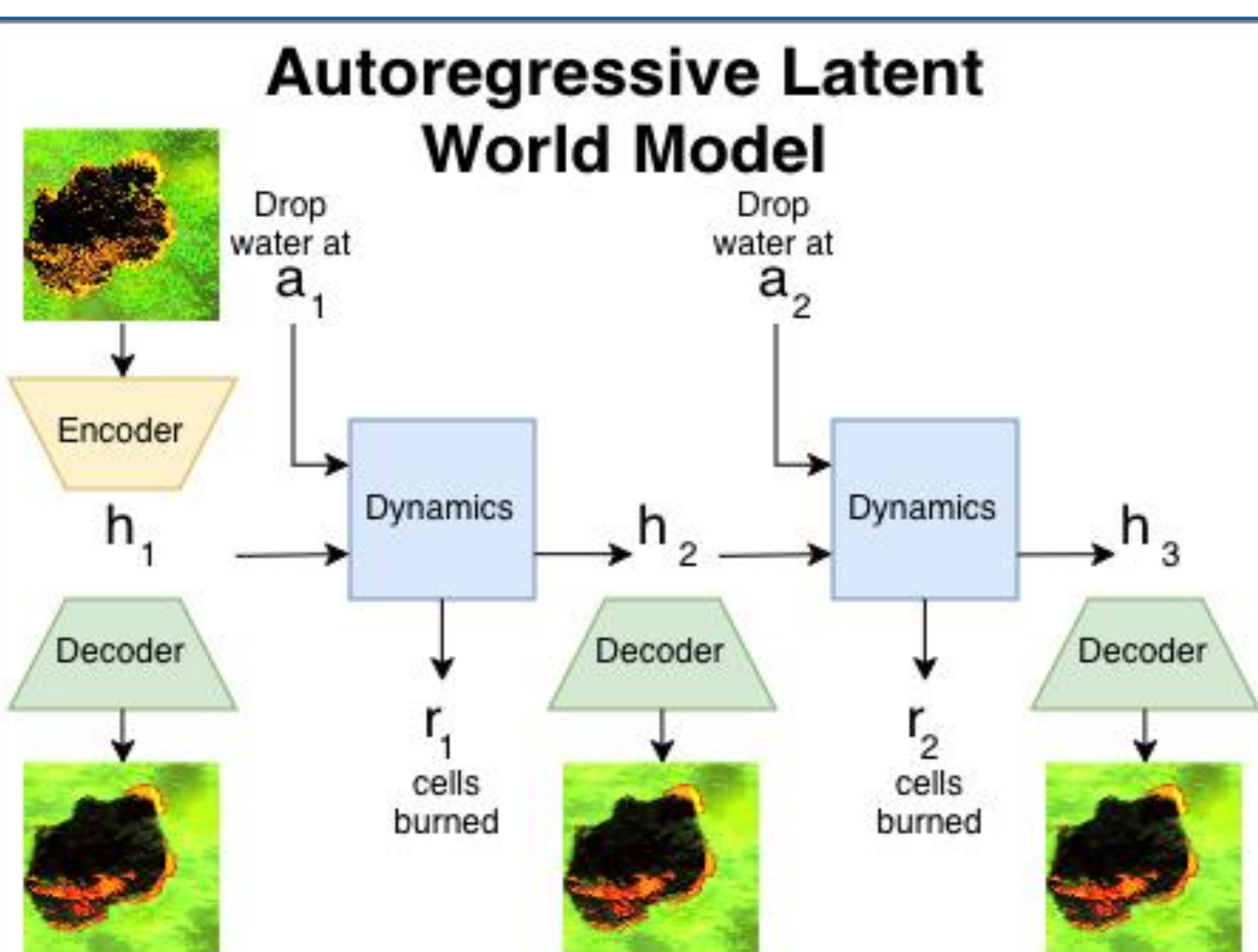
The annual cost of wildfires has been increasing, costing tens of billions of dollars every year in the U.S. alone. Despite decades of firefighting and tens of millions of dollars spent on research, effectively containing and suppressing wildfires remains a formidable challenge due to its complex dynamics. Our work helps lay the foundation to further research in firefighting strategies using AI / machine learning (ML).

Motivation for AI

AI has seen great successes in:

- Board/Video Games
- Algorithm Discovery
- Scientific Breakthroughs
- Weather Modeling

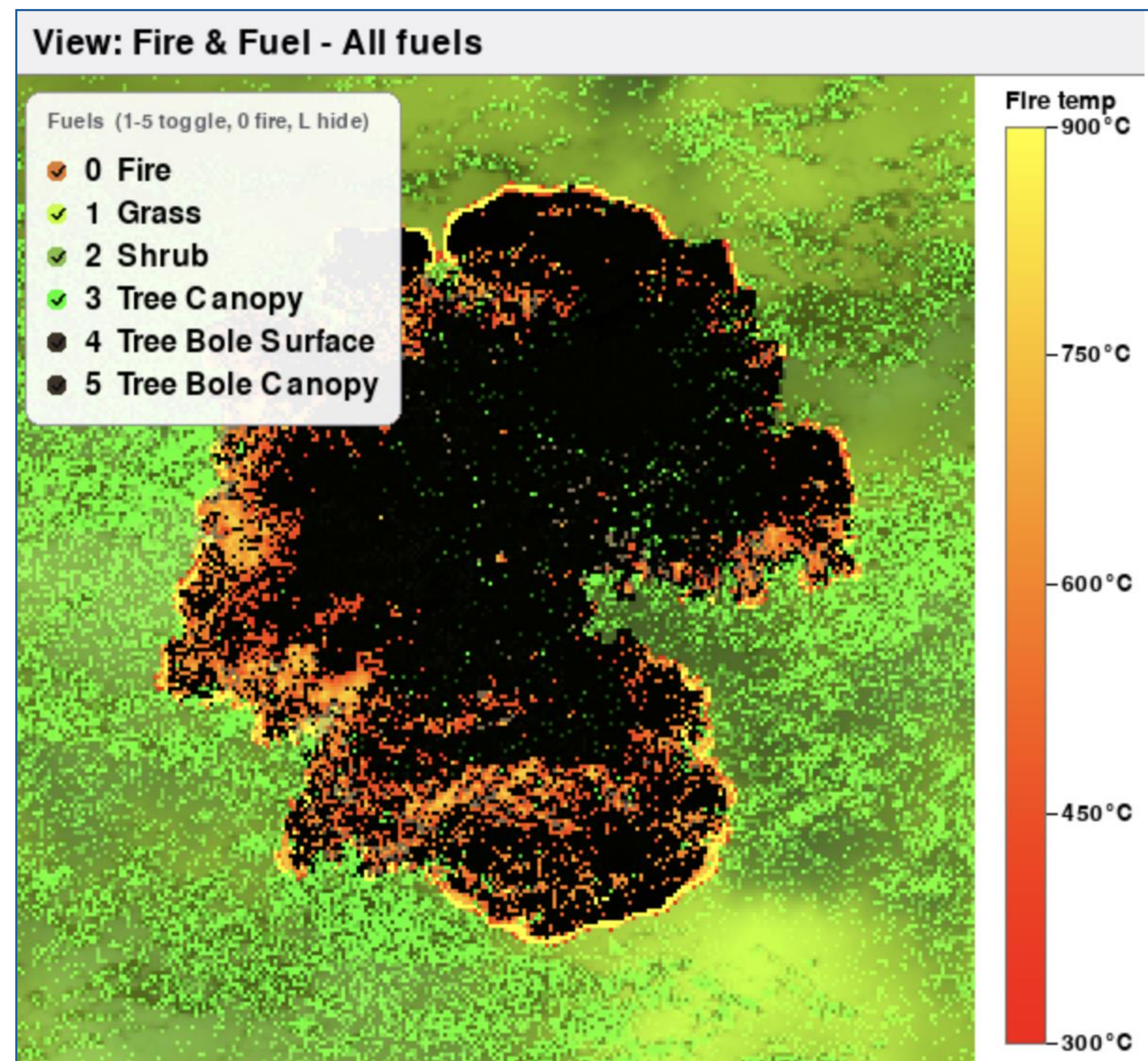
AI have shown to be able to discover novel solutions to difficult problems, oftentimes better than the best human solutions. Can this be applied to fighting wildfires?



Objective

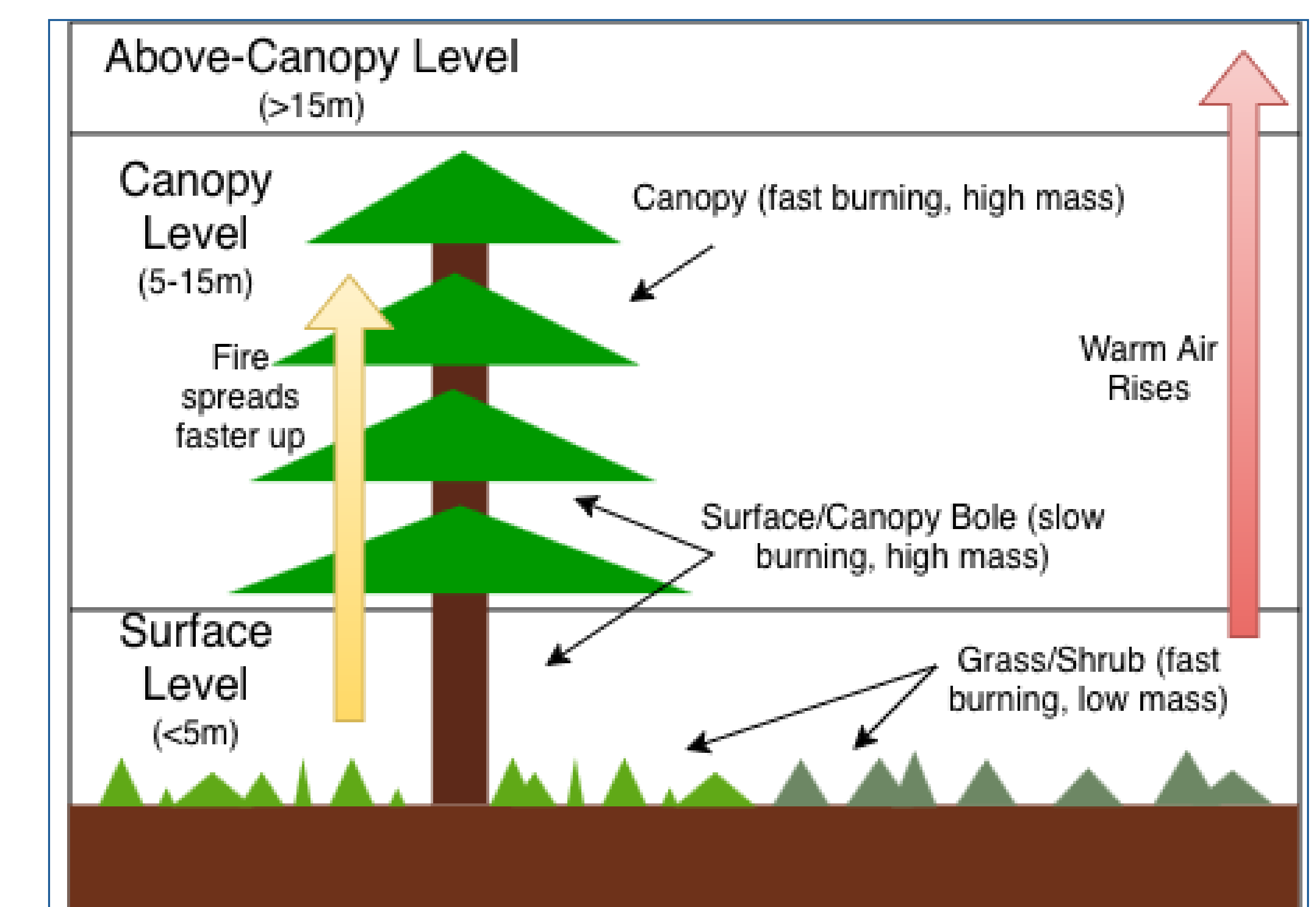
To lay the groundwork for further research toward AI methods:

- Provide a fast, configurable wildfire simulation that still captures some real-world complexities.
- Provide a suite of machine learning tools, detailed documentation, and an intuitive UI for making use and research easier.



Model Features

- Simplified atmospheric coupling
- Fuel-fuel and fuel-air heat exchange
- Fully config-driven fuel types
- Wind-terrain interaction
- Rothermel fire dynamics
- Oxygen diffusion and advection



Future Work

- AI firefighting agents
- Static fire barriers (rivers, roads, etc.)
- More expressive actions (firelines)
- Resource constraints for the agent
- Objective points to protect (e.g. structures)

Acknowledgements

We would like to extend a huge thanks to the MILES group - especially David John Gagne, Charlie Becker, and Daniel Neamati - all the SIParCS interns, Virginia Do and Jessica Amaya, Pedro Jimenez Munoz, and everyone else who made this project possible.

This material is based upon work supported by the NSF National Center for Atmospheric Research, which is a major facility sponsored by the U.S. National Science Foundation under Cooperative Agreement No. 1852977.