IMPERIAL

SCALED

SCALable gEnerative founDational model for Computational Physics

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Introduction:
From AIGC to Computational Physics

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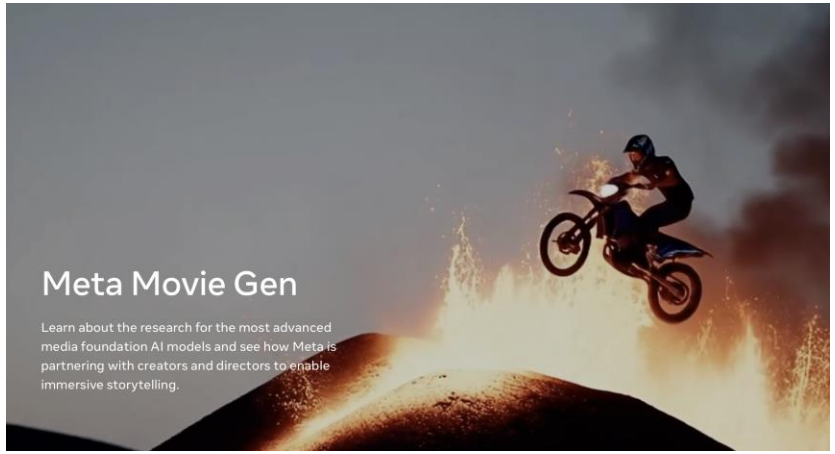
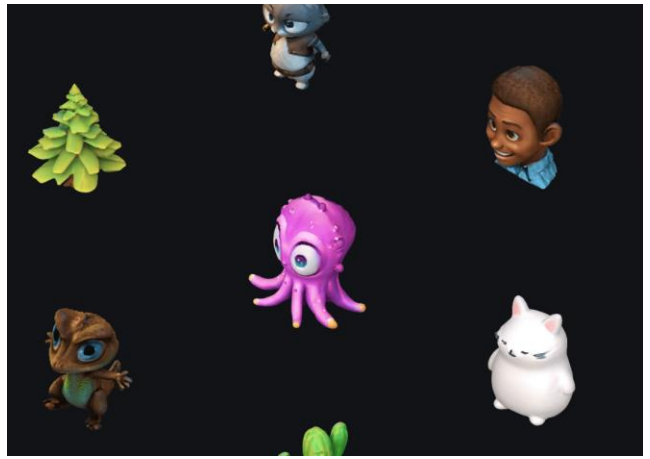
From AIGC(Artificial Intelligence Generated Content) to Computational Physics



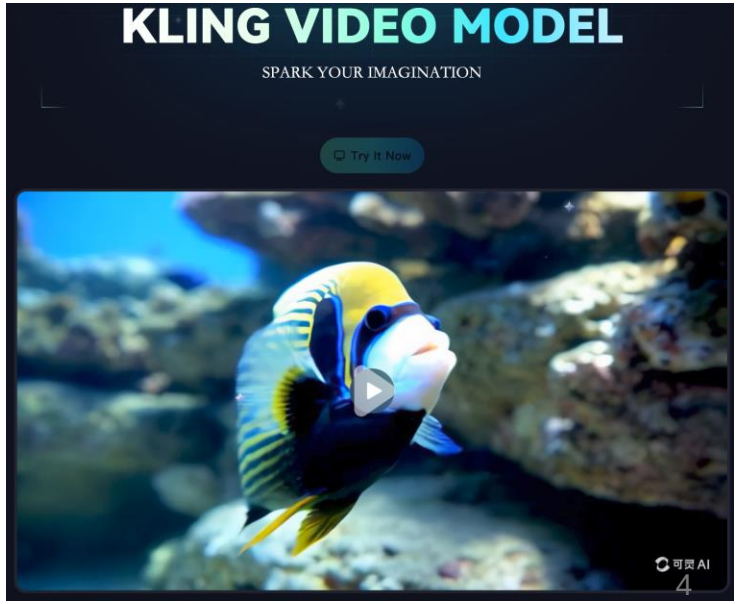


New #1 AI Video Generator

Hunyuan Video

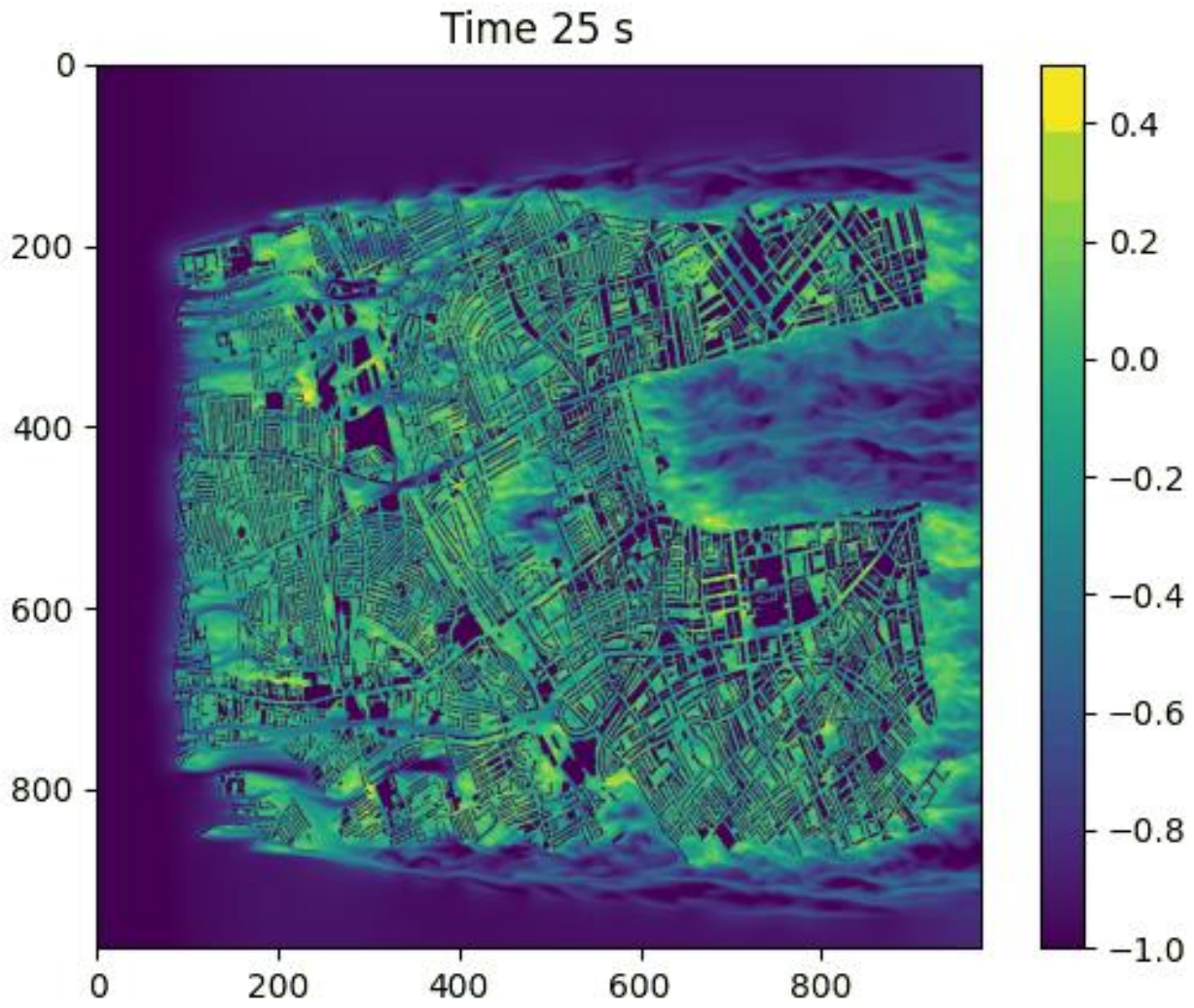
Hunyuan AI Video is a new, state of the art, AI Video Generator that creates high-quality videos from text descriptions. With 13B parameters and state-of-the-art performance, it's the most powerful open-source video generation model available.

Start Creating Now



Introduction:

The cross-section shown in the figure represents fluid flow at 4 meters above ground level. The darkest areas in the central of the figure indicate building cross-sections, while the remaining regions depict the velocity of the fluid.

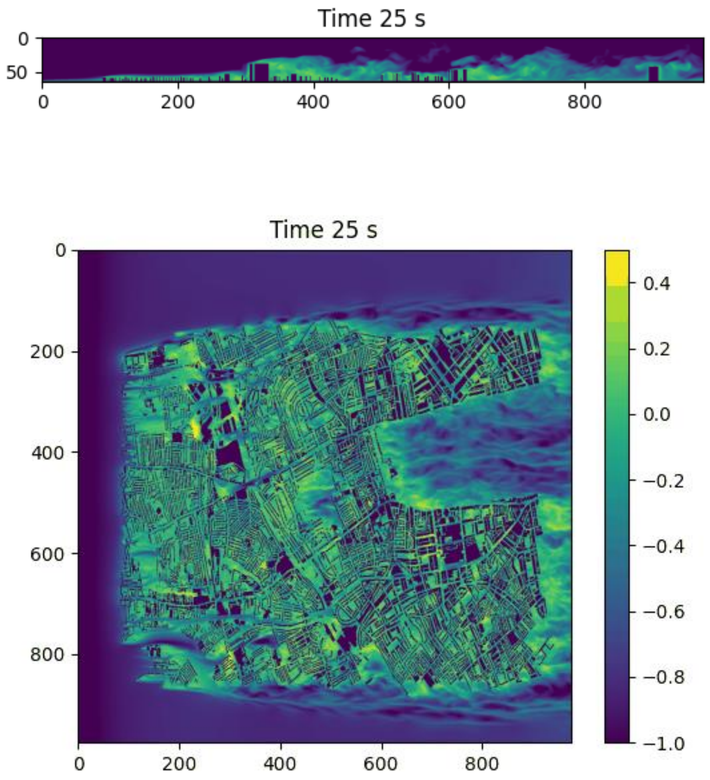


Methodology:

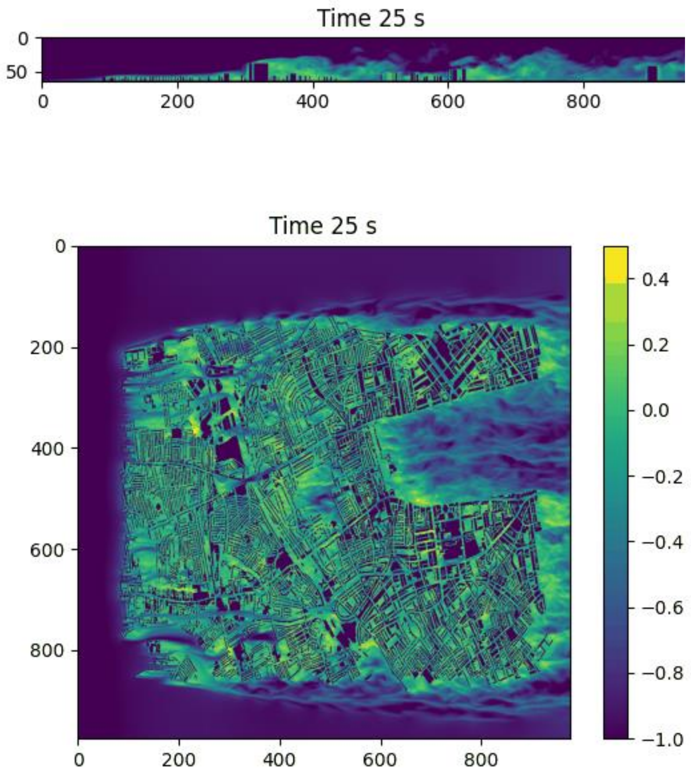
- Diffusion Framework for Scalable and Statistic Stability
- Denoising Net: CNN for constructing Physics Relationship
- Domain decomposition for Scaling up

Model Result
Scalable/Grid-invariant/Geometry-invariant

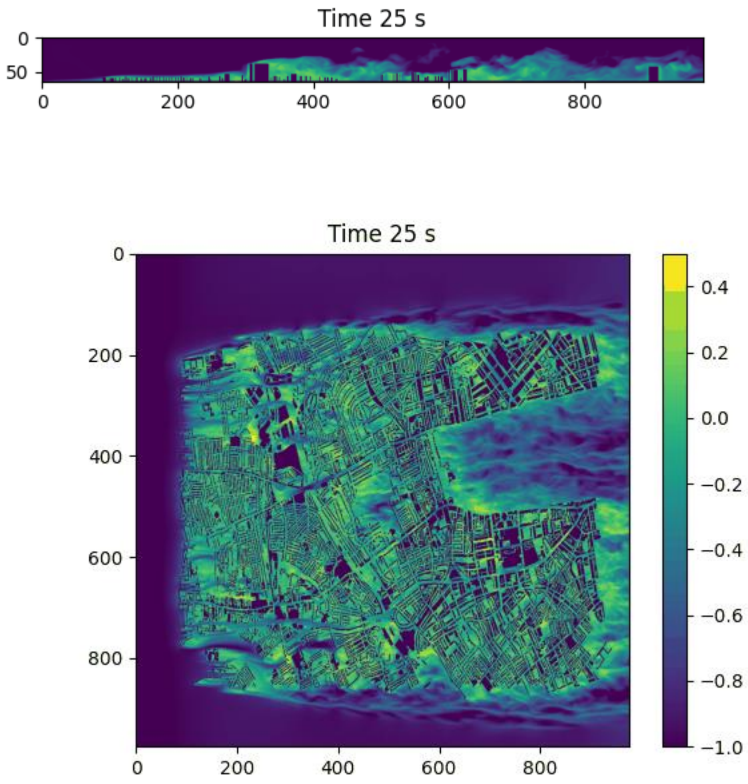
Model Result demonstration
Flow Past South Kensington



Gound Truth

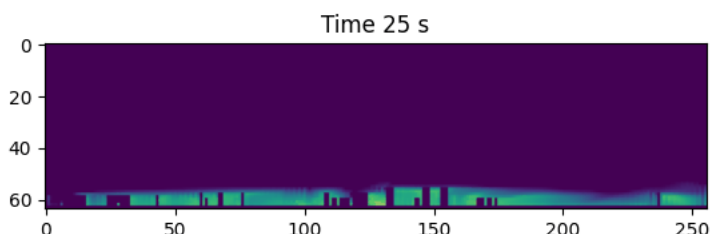


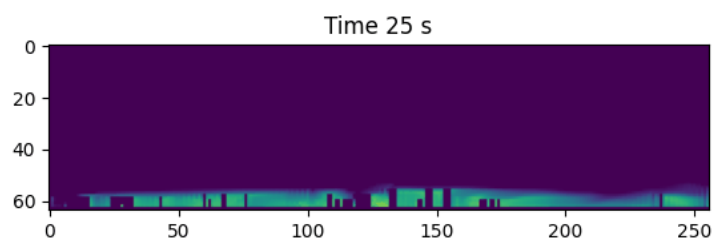
SCALED Result

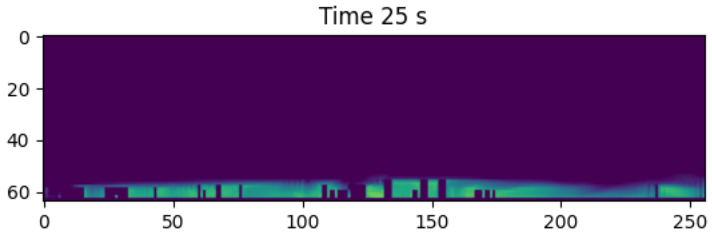


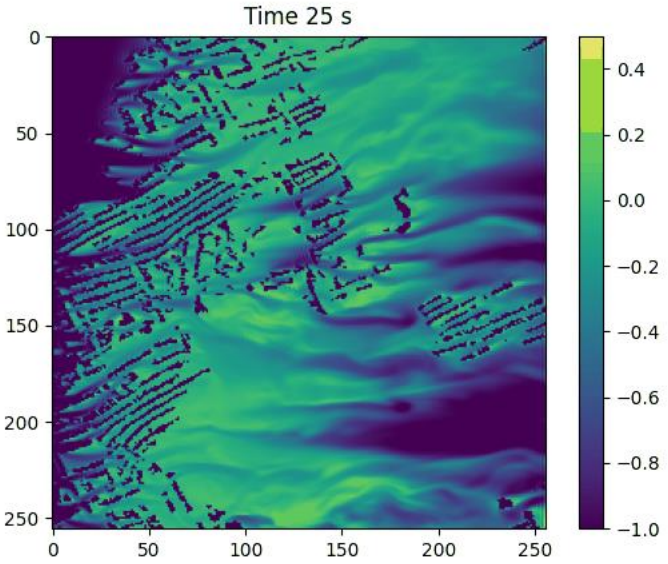
UNET Result

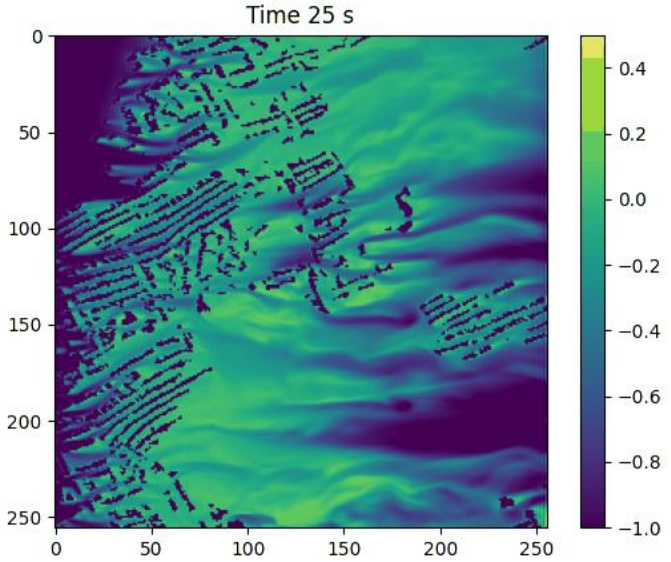
Model Result demonstration
Flow Past Generated Area

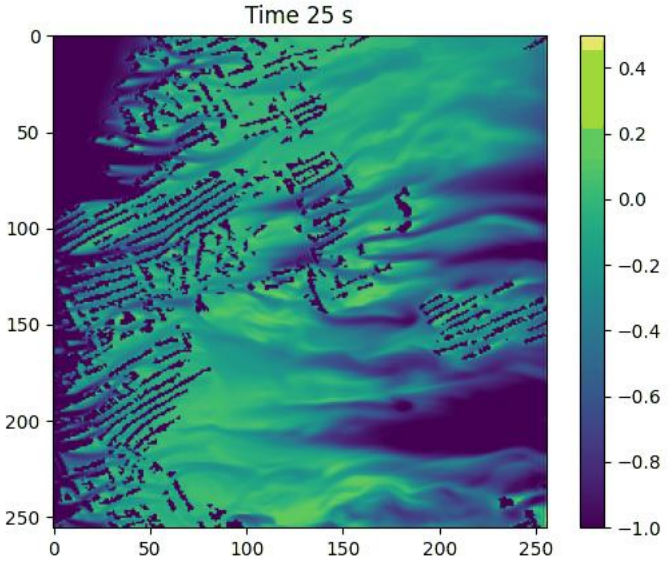










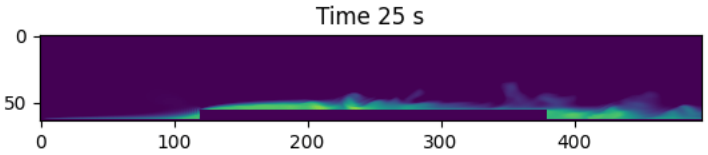


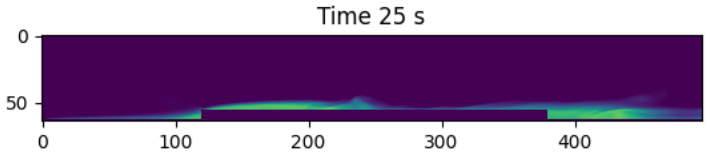
Gound Truth

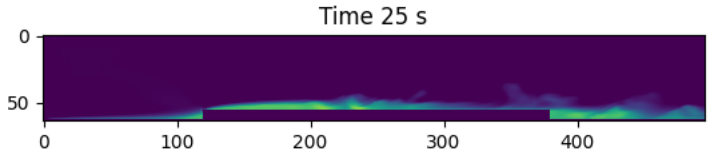
SCALED Result

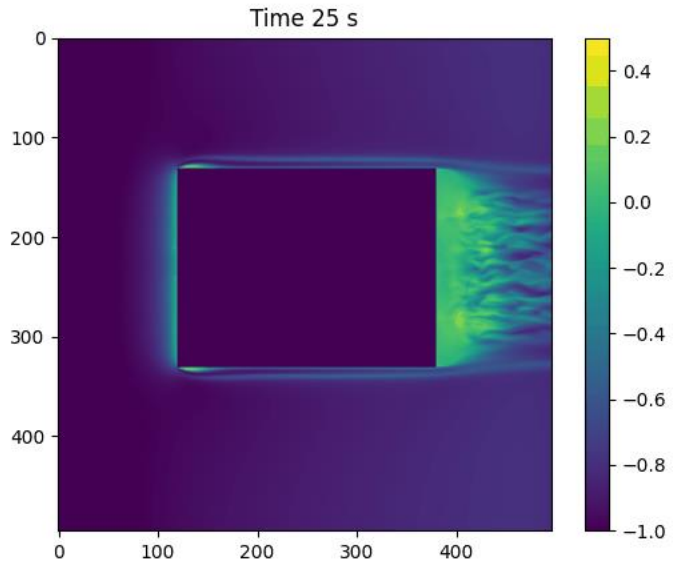
UNET Result

Model Result demonstration
Flow Past Large Square Area

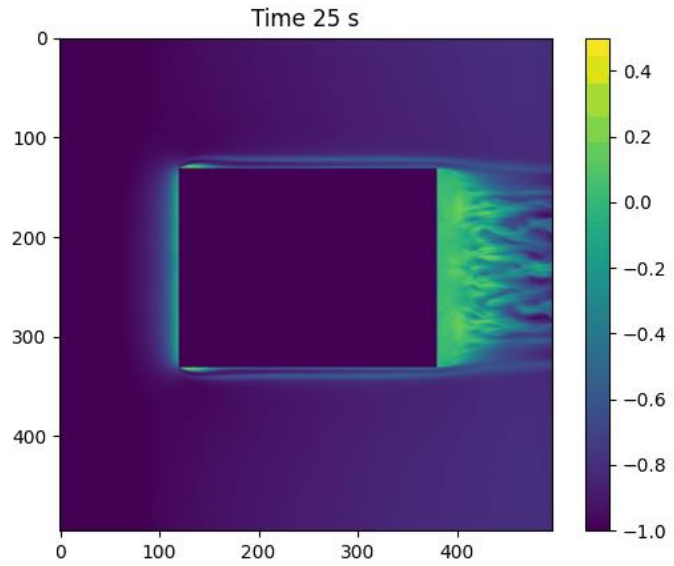




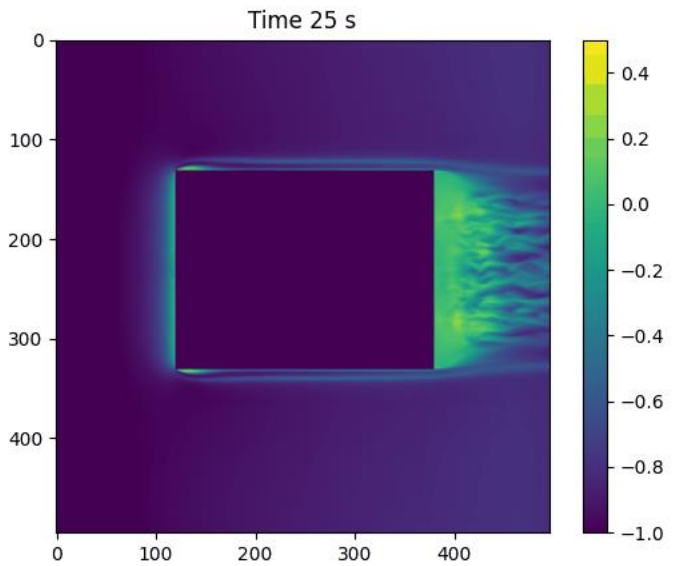




Gound Truth



SCALED Result



UNET Result

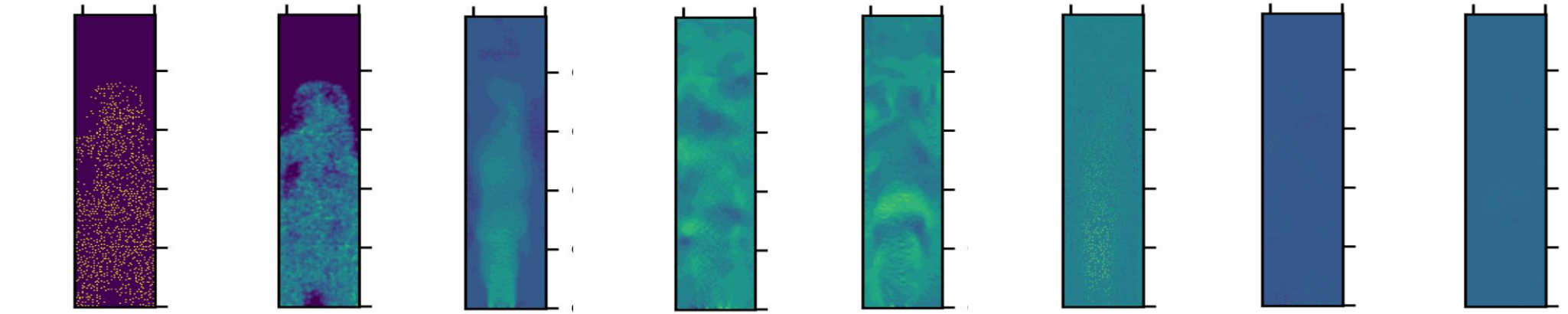
Conclusion and Future Work

SCALED-X: extend scaled to multi-physics problems

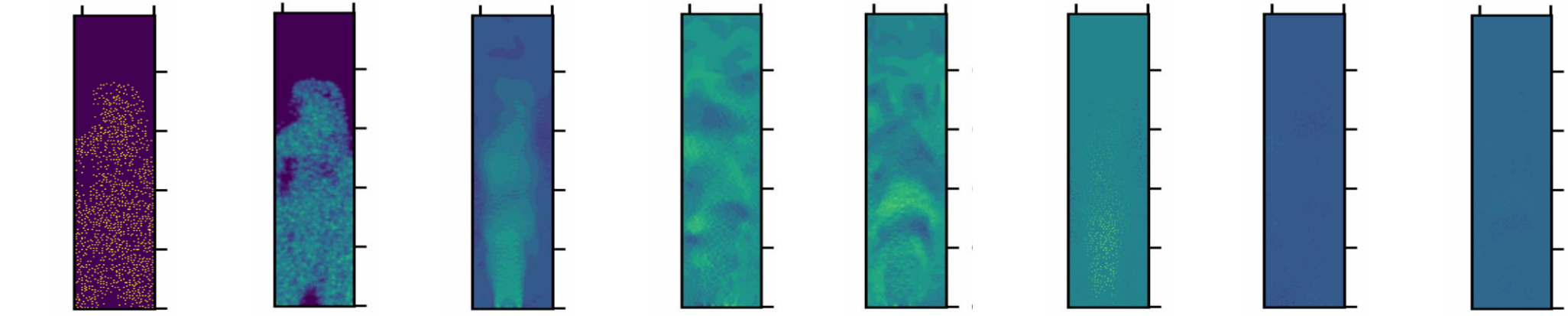
SCALED-S: enhance scaled speed

SCALED-X: extend scaled to multi-physics problems

Result Generated by SCALED



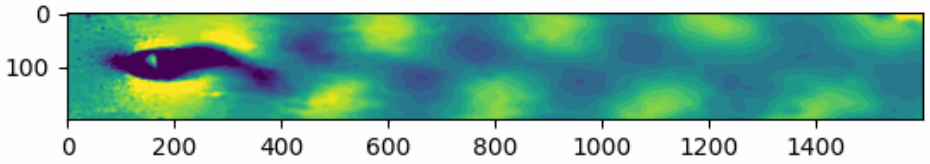
Result Generated by numerical solver

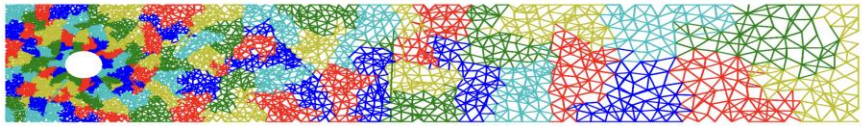


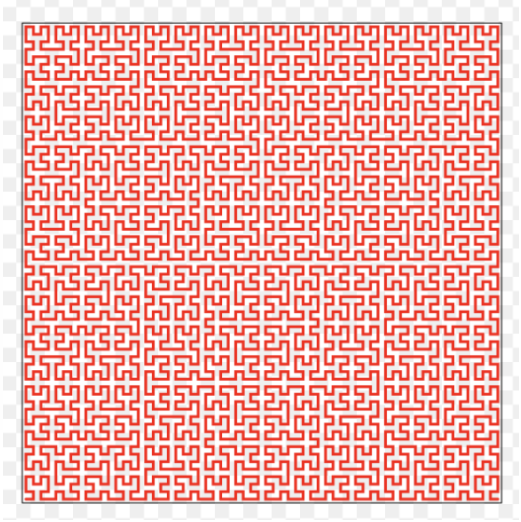
Particle Position | Particle Volume | flow velocity on z direction | flow velocity on y direction | flow velocity on x direction | Particle velocity on z direction | Particle velocity on y direction | Particle velocity on x direction

Particle on fluidized bed problems

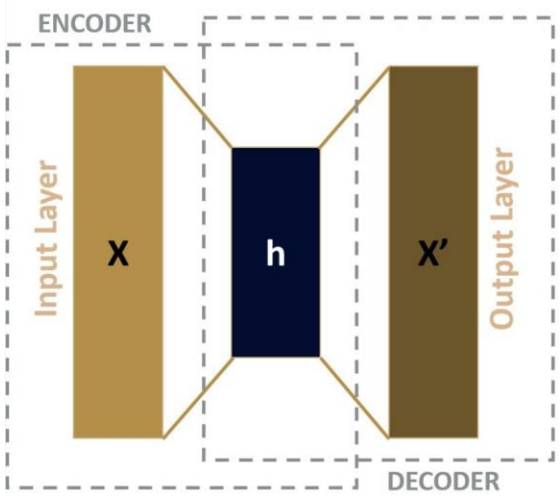
SCALED-X: extend SCALED to multi-physics problems







Space filling curve method:
Using adoptive mesh method and unstructured mesh method for acceleration.



Auto-encoder compression method: compress the primitive variable into latent space and inference on the latent space. Could accelerate 100x.

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Thank You

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