

ESCH — NUMERICAL TYPOGRAPHY

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1 | Symbols and Letters

2 | Strings of quantity...

3 | ... and strings thereof...

4 | ... and strings thereof

5 | Meshes

6 | Simulations

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- ▶ A shared fact of these sets is the care with which their members have so often been drawn

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A B C D E F G H I J K L M N O P Q R S T U V X Y Z
a b c d e f g h i j k l m n o p q r s t u v x y z
А Б В Г Д Е Ё Ж З И Й К Л М Н О П Р С Т У Ф Х Ц Ч Ш Щ Ъ Ы Ь Э Ю Я

*Figure 1: The Latin alphabet in double-struck (top) and Fraktur (middle),
and the Cyrillics in Libertinus Serif (bottom)*

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- ▶ esch—using $\tanh(x) = \frac{e^x - e^{-x}}{e^x + e^{-x}}$ to map $\mathbb{R} \rightarrow [-1, 1]$ —thus targets a continuous alphabet

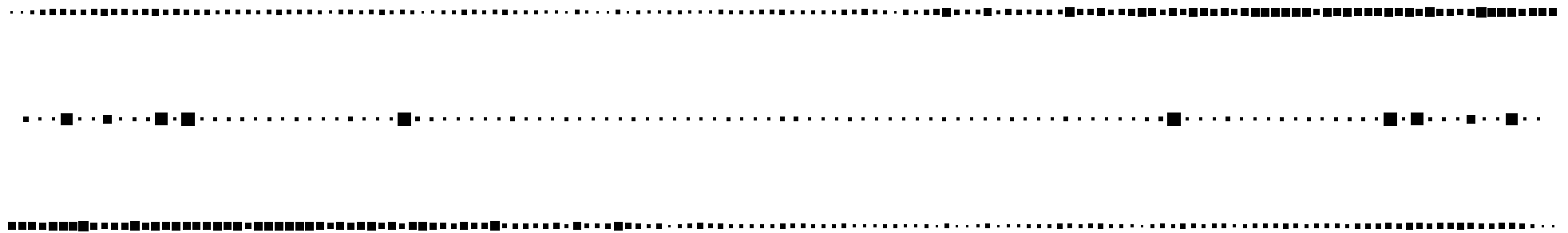


Figure 2: Three strings (or vectors) of varying length typed in esch

3 | ... and strings thereof...

- Stack esch strings to represent matrices...

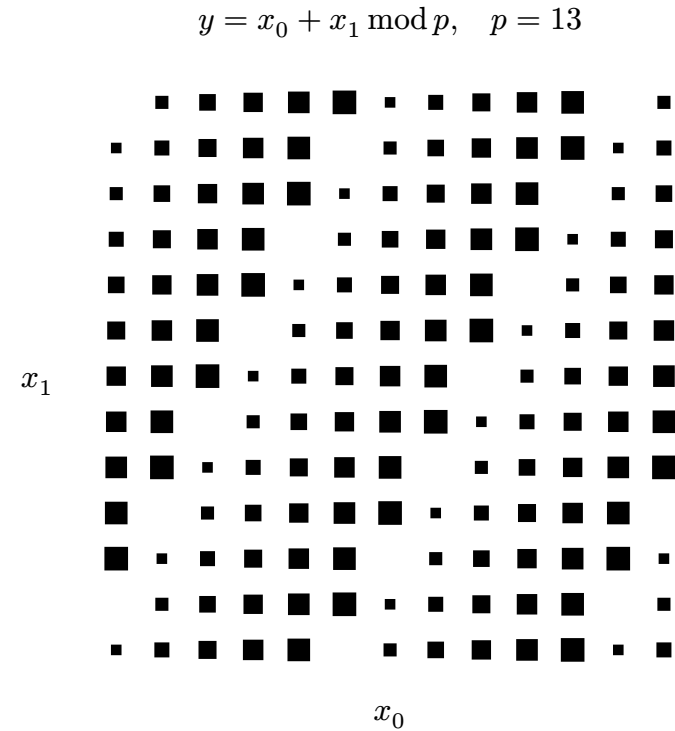


Figure 3: Target for mech. interp. task [1]

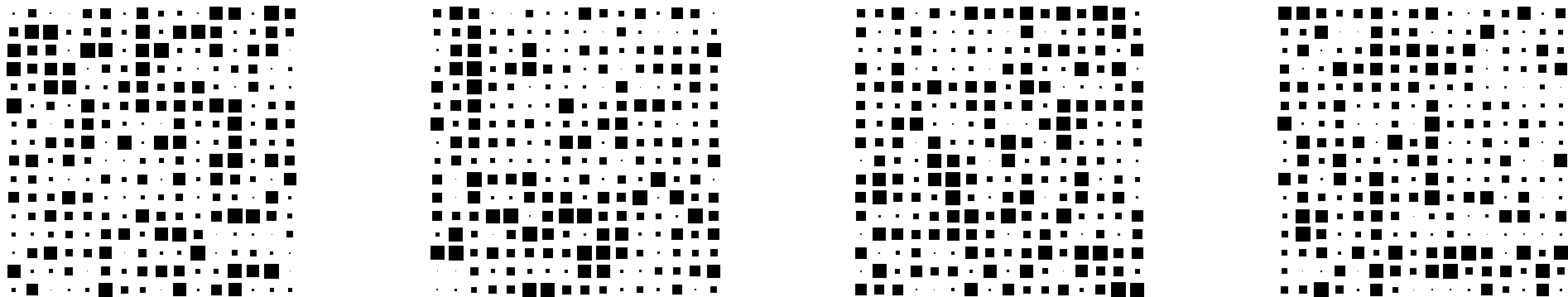
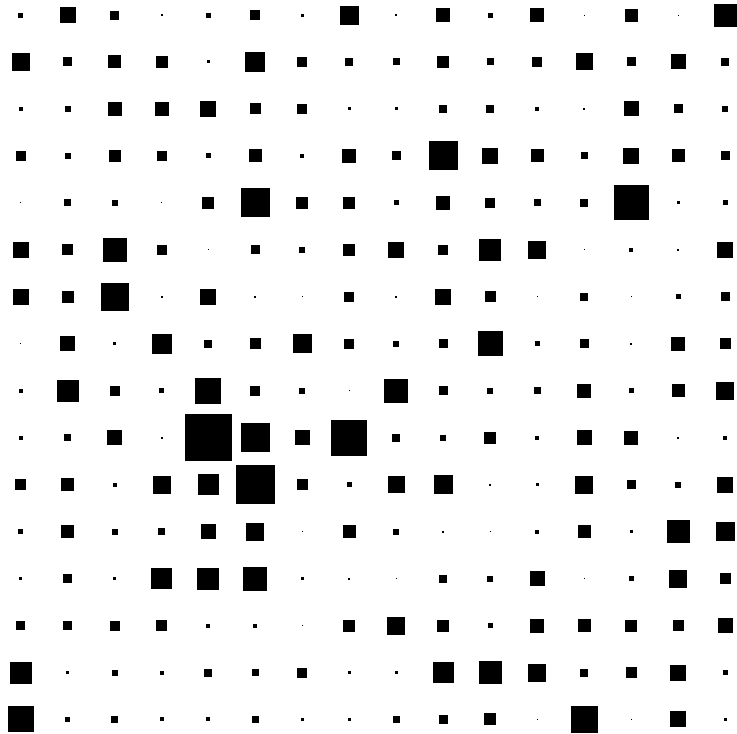


Figure 4: Four 16×16 uniformly random matrices

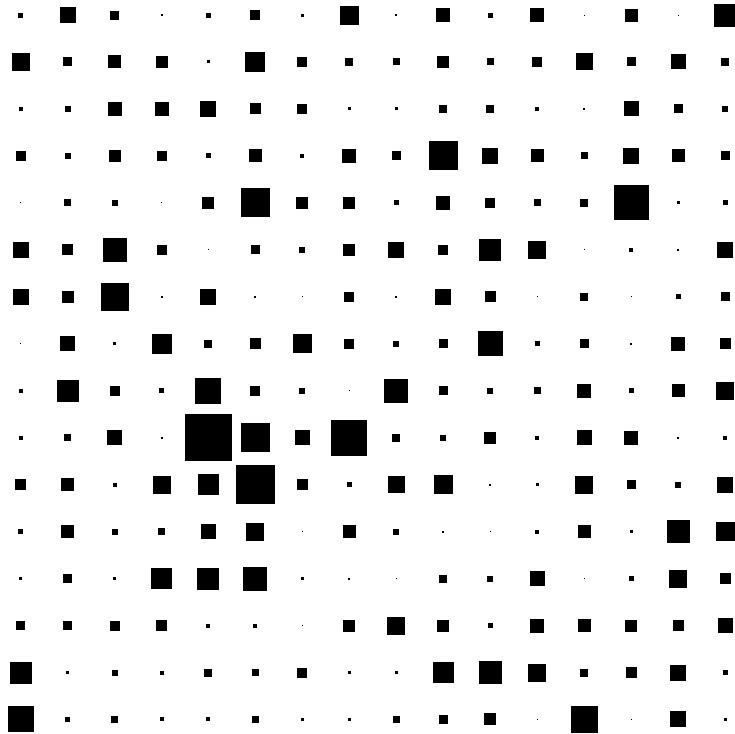
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- ▶ Show training dynamics in deep learning...

Figure 5: $16 \times 16 \times 80$ tensor (last dim. temporal)

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- ▶ Temporal interpretations of a given dimension
- ▶ Show training dynamics in deep learning...
- ▶ ... and whatever else

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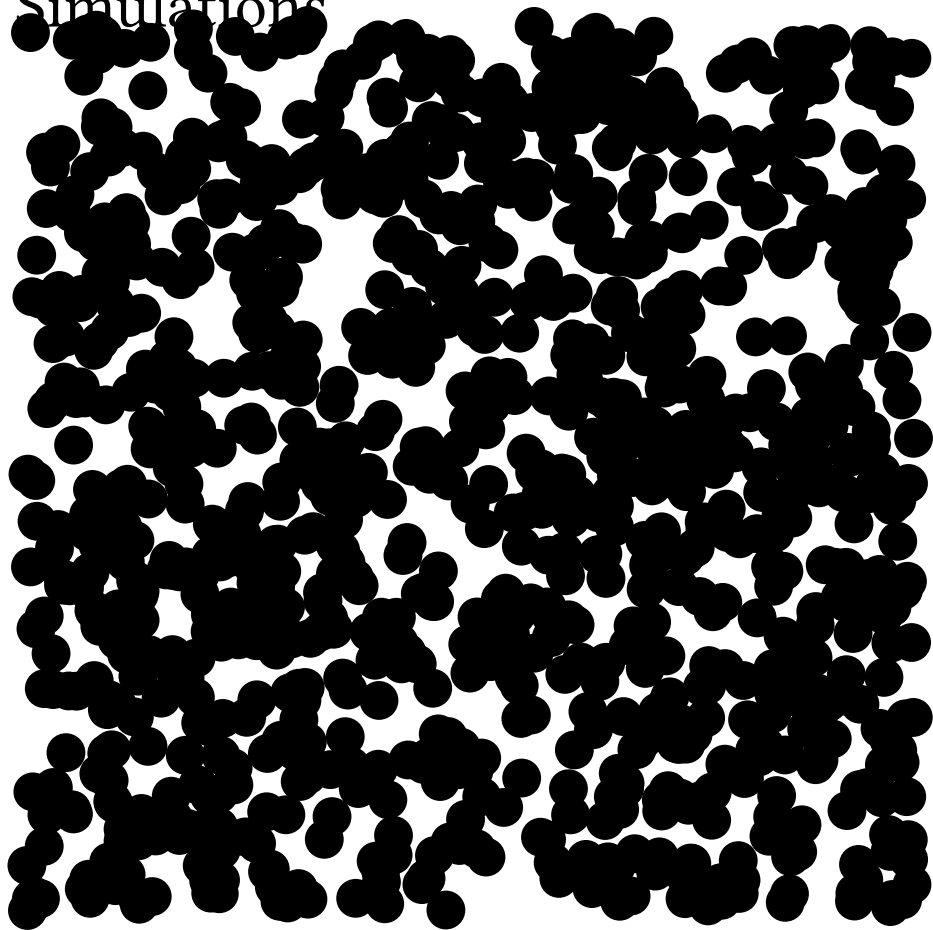
5 | Meshes

- ▶ Allow for arbitrary positions of points
- ▶ Figure 6 shows fMRI (brain scan) data [2], [3]



Figure 6: fMRI data

6 | Simulations



- Fix sizes and animate positions

*Figure 7: $\sim U(0, 1) \rightarrow \sim U(0, 1)$ simulated in
Parabellum [4]*

References

- [1] N. Nanda, L. Chan, T. Lieberum, J. Smith, and J. Steinhardt, “Progress Measures for Grokking via Mechanistic Interpretability,” no. arXiv:2301.05217. arXiv, Oct. 2023.
- [2] A. T. Gifford *et al.*, “The Algonauts Project 2023 Challenge: How the Human Brain Makes Sense of Natural Scenes,” no. arXiv:2301.03198. arXiv, Jan. 2023.
- [3] E. J. Allen *et al.*, “A Massive 7T fMRI Dataset to Bridge Cognitive Neuroscience and Artificial Intelligence,” *Nature Neuroscience*, vol. 25, no. 1, pp. 116–126, Jan. 2022, doi: 10.1038/s41593-021-00962-x.
- [4] T. Anne *et al.*, “Harnessing Language for Coordination: A Framework and Benchmark for LLM-Driven Multi-Agent Control,” *IEEE Transactions on Games*, pp. 1–25, 2025, doi: 10.1109/TG.2025.3564042.