

HiPiler:

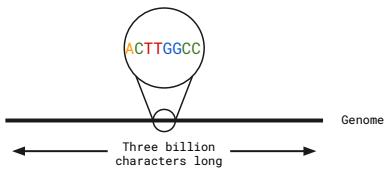
Visual exploration of large **genome interaction matrices** with interactive **small multiples**

F. Lekcharo, B. Bach, P. Kerpedjiev, N. Gehlenborg and H. Pfister
IEEE Trans. on Vis. and Com. Grph. (Jan. 2018)
<http://hipiler.hgglabs.info>

Presented by Baraa Orabi
CPSC 547 Information Visualization
The University of British Columbia
2019-11-19

Some background

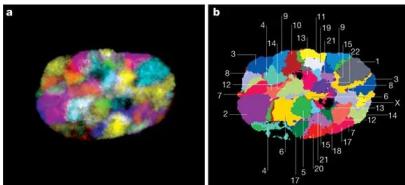
Genome



Genome is 3D



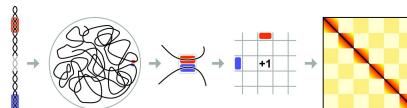
3D Genome of single* cell reconstructed



What data are we dealing with?

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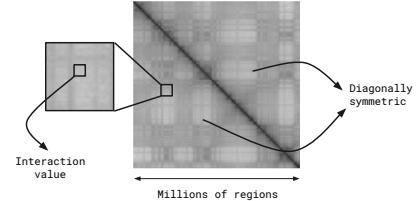
Hi-C data



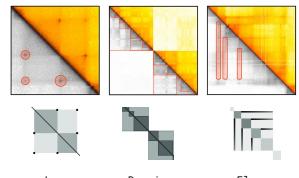
Edited Fig. 3 from HiPiler paper

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Interaction Matrix



Why: Regions of Interest (ROI)



Remade from Fig. 4 of HiPiler paper

Interaction Matrix

Task

- View ROI's
- Examine pattern of ROI
- Compare patterns of different ROI's
- Preserve global context

Challenge

- Too many ROI's
- Need to zoom
- Often far away

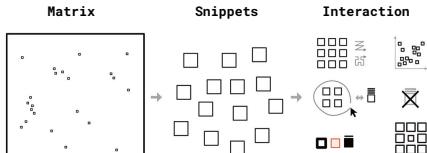
How: HiPiler



Task abstraction (abridged)

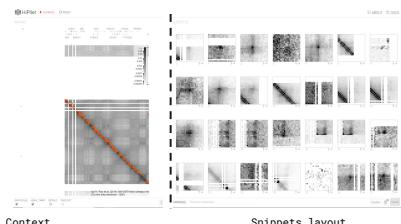
1. Search for known patterns
2. Examine one instance
3. Compare instances

The How



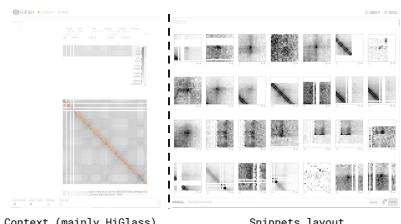
Reannotated from Fig. 7 of HiPiler paper

The How



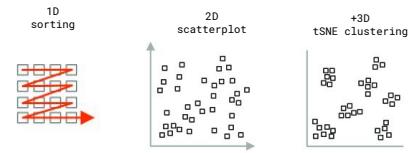
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The How



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Layout (using user specified metrics/attributes)



Remade from Fig. 5 of HiPiler paper

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Layout: Multi-dimensional clustering

- tSNE clustering
- Configurable



Remade from Fig. 5 of HiPiler paper

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Evaluation

- Five domain experts/users
- 1-2 hours interview
 - Training
 - Pre-prepared data
 - Own data

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Evaluation feedback

- Good snippet/matrix linking
- Validated (behaviourally) task abstractions
- Easy to learn
- Big improvement on state-of-the-art

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Aggregation



Remade from Fig. 5 of HiPiler paper

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Stated Limitations

- Only square ROI
- Fixed rows/cols order
- Scalability (beyond 2000 snippets)

Critique

Great!

- Tool:
 - Open source
 - Nice aesthetic
 - Does what it says!
- Paper:
 - Easy to read
 - Great online resources (demo, video, slides, docs, etc...)

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Not so great :-(

- Software:
 - Selection sucks, real bad
 - Slow (too much on-the-go computation)
 - Heavy on client-side memory
 - Unintuitive settings
 - Very buggy
 - Too much installation overhead (server)

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Summary



What?

Interaction matrix

Why?

Explore and validate

How?

Snippets:

- Linked
- Laid out
- Select/Aggregate/Filter

Thanks! Questions?

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