Representation tradeoffs for hyperbolics Embeddings

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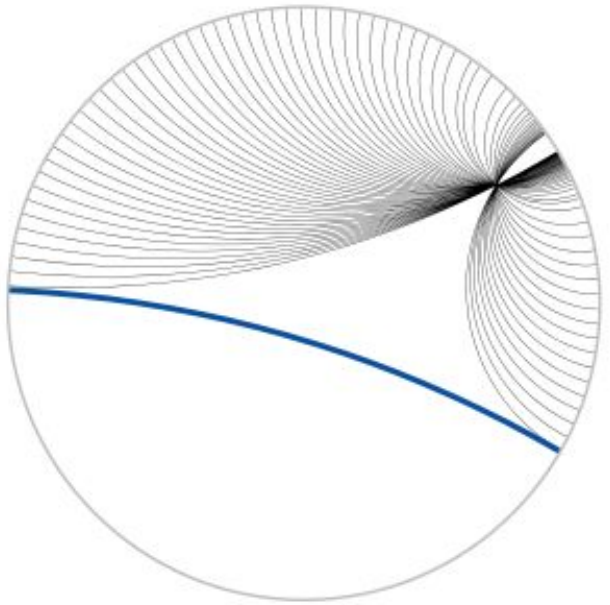
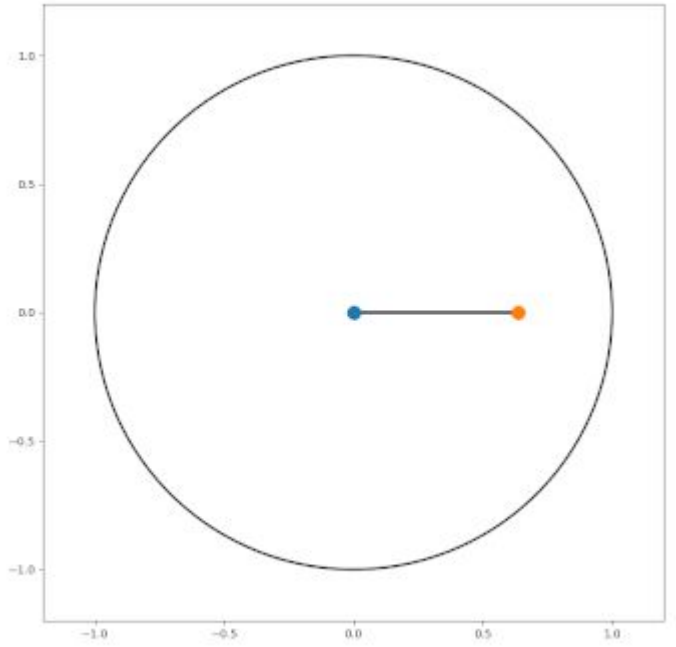
Problem overview

- Modeling semantic hierarchies are hard for example: persian -> cat -> pet
- It has been found that hyperbolic geometry is adequate for modeling hierarchical structures



Embedding algorithm.(Sarkar)

- every node in a tree is assigned a point in the disk (Using a straightedge and compass construction).
- The algorithm is recursive and linear in the number of edges.
- By construction, for a tree, the MAP is always 1. Nevertheless, there is a trade off in keeping the worst case distortion low and increasing number of bits using in the computation



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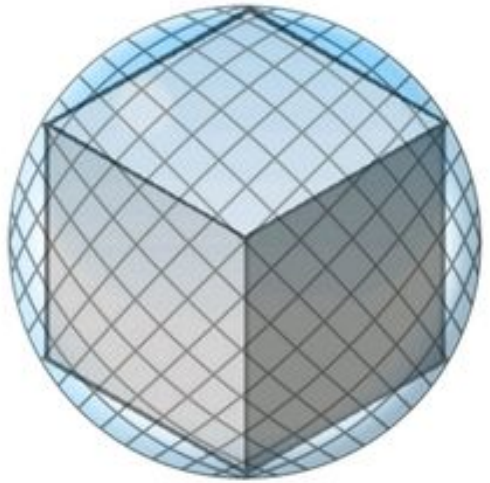
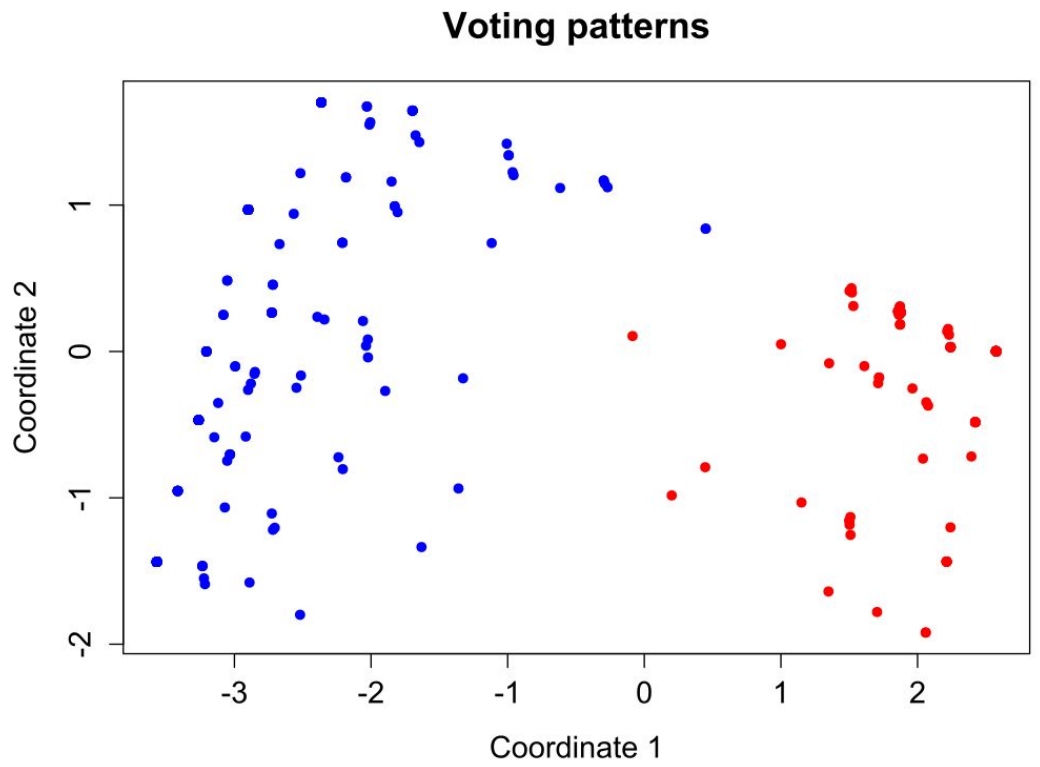
Multidimensional Generalization

- An alternative for reducing the bits required and ensuring a good distortion is do the embedding in the n-Poncaire sphere rather than doing it in the Poncaire disk.
- Is the same algorithm but now instead of using a straightedge and compass for construct the embeddings a more code-theoretical approach is used: choosing corners in the unit cube using the -hadamar code.



Second approach to the problem

- Using an hyperbolic analogous of multidimensional scaling.
- A solution to another problem : from a set of distances recover the points where the distances come from.



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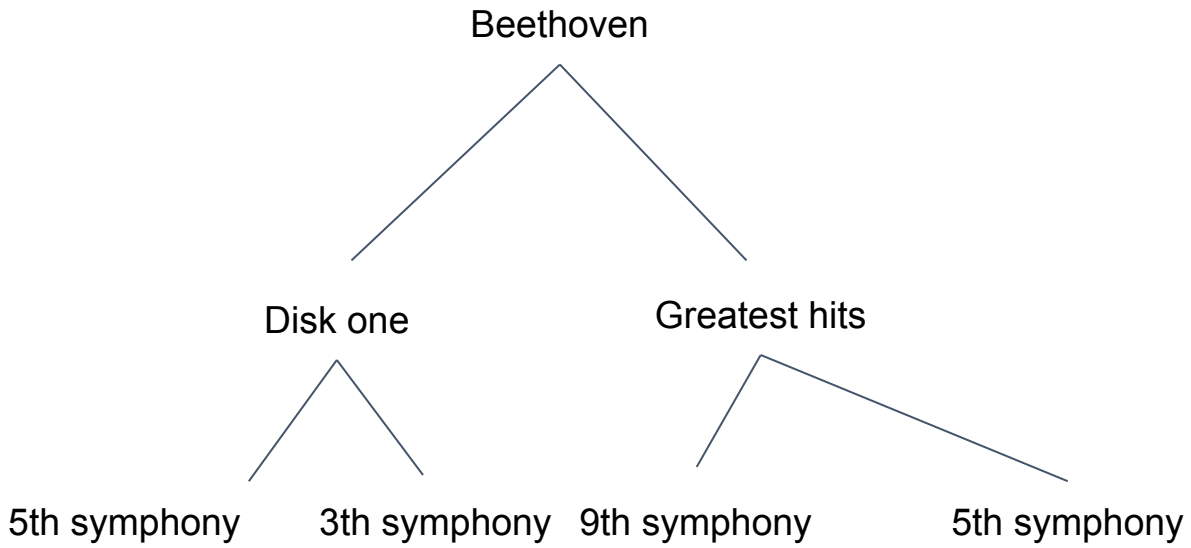
Music brainz adaptation

- Baseline only with artist, album and songs.
- The graph is made as a tree:
  - A group of artist is treated as another artist.
  - A song belonging to two albums is assigned to every album it belongs.



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