HAAG Weekly Report Week 6

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Time-Log

- What did you do this week?
  - Wrote code to build a statistical shape model by performing PCA on moving point set.
  - Wrote documentation to represent the math involved in the CPD algorithm.
  - Researched and implemented the substitution for the SSM instead of the displacement vector.
- What are you going to do next week
  - Update the code to include statistical shape model for the EM step of the algorithm.
  - Work on testing performance of the algorithms against the standard CPD algorithms.
- Blockers, things you want to flag, problems, etc.
  - No current blockers.

Abstracts

Gatti, et al. (2024). ShapeMed-Knee: A Dataset and Neural Shape Model Benchmark for Modeling 3D Femurs.

Analyzing anatomic shapes of tissues and organs is pivotal for accurate disease diagnostics and clinical decision-making. One prominent disease that de- pends on anatomic shape analysis is osteoarthritis, which affects 30 million Americans. To advance osteoarthritis di- agnostics and prognostics, we introduce ShapeMed-Knee, a 3D shape dataset with 9,376 high-resolution, medical- imaging-based 3D shapes of both femur bone and cartilage. Besides data, ShapeMed-Knee includes two benchmarks for assessing reconstruction accuracy and five clinical prediction tasks that assess the utility of learned shape representations. Leveraging ShapeMed-Knee, we develop and evaluate a novel hybrid explicit-implicit neural shape model which achieves up to 40% better reconstruction accuracy than a statistical shape model and implicit neu- ral shape model. Our hybrid models achieve state-of- the-art performance for preserving cartilage biomarkers; they're also the first models to successfully predict lo- calized structural features of osteoarthritis, outperforming shape models and convolutional neural networks applied to raw

magnetic resonance images and segmentations. The ShapeMed-Knee dataset provides medical evaluations to reconstruct multiple anatomic surfaces and embed mean- ingful disease-specific information. ShapeMed-Knee re- duces barriers to applying 3D modeling in medicine, and our benchmarks highlight that advancements in 3D mod- eling can enhance the diagnosis and risk stratification for complex diseases. The dataset, code, and benchmarks will be made freely accessible

What did you do and prove it

Github PR: https://github.com/Nikitos1865/pycpd-Porto/pull/1/files

Documents written: https://humanaugmente-e7j6563.slack.com/archives/C08990A405C/p1739571500937269