Toric Degenerations of Varieties: Theory and Computations.

A Data Management Plan created using DMPonline.be

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Project abstract:

My project lies in the area of Commutative Algebra and its interactions with Algebraic Geometry, Tropical Geometry, Combinatorics, and Convex Geometry. The main goal is to associate convex polytopes to algebraic varieties such that significant geometric properties of the variety can be read off from their polytopes. The appearance of convex polytopes in algebraic geometry goes back to Sir Isaac Newton. For example, a toric variety is a certain algebraic variety modeled on a convex polytope. My main goal is to develop new and unifying tools to extend the tools from toric varieties to general varieties via toric degenerations.

I will first develop combinatorial tools to construct points in tropical varieties and study their associated Gröbner degenerations. Then, I find explicit characterization for such points leading to toric degenerations, that is their corresponding polynomial ideal is binomial and prime. Furthermore, I will study the relations among toric degenerations of a given variety by studying their associated polytopes. In particular, I will study the combinatorial mutations of these polytopes. My goal is to determine isomorphic degenerations and characterize them. Finally, I will provide algorithms to compute tropicalization and toric degenerations for specific families of varieties. As a particular case, I plan to study the Grassmannians and flag varieties.

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1. Research Data Summary

List and describe all datasets or research materials that you plan to generate/collect or reuse during your research project. For each dataset or data type (observational, experimental etc.), provide a short name & description (sufficient for yourself to know what data it is about), indicate whether the data are newly generated/collected or reused, digital or physical, also indicate the type of the data (the kind of content), its technical format (file extension), and an estimate of the upper limit of the volume of the data.

				Only for digital data	Only for digital data	Only for digital data	Only for physical data
Dataset Name	Description	New or reused	Digital or Physical	Digital Data Type	Digital Data format	Digital data volume (MB/GB/TB)	Physical volume
		Please choose from the following options: • Generate new data • Reuse existing data	*Please choose from the following options:* • Digital • Physical	*Please choose from the following options:* • Observational • Experimental • Compiled/aggregated data • Simulation data • Software • Other • NA	*Please choose from the following options:* • .por, .xml, .tab, .cvs,.pdf, .txt, .rtf, .dwg, .gml, … • NA	*Please choose from the following options:* • <100MB • <1GB • <100GB • <1TB • <5TB • <10TB • <50TB • >50TB • NA	
Software packages	Software packages	Generate new data	Digital	Software	NA	NA	NA

If you reuse existing data, please specify the source, preferably by using a persistent identifier (e.g. DOI, Handle, URL etc.) per dataset or data type:

Not applicable

Are there any ethical issues concerning the creation and/or use of the data (e.g. experiments on humans or animals, dual use)? Describe these issues in the comment section. Please refer to specific datasets or data types when appropriate.

- No

Will you process personal data? If so, briefly describe the kind of personal data you will use in the comment section. Please refer to specific datasets or data types when appropriate.

- No

Does your work have potential for commercial valorization (e.g. tech transfer, for example spin-offs, commercial exploitation, …)? If so, please comment per dataset or data type where appropriate.

- No

Do existing 3rd party agreements restrict exploitation or dissemination of the data you (re)use (e.g. Material/Data transfer agreements/ research collaboration agreements)? If so, please explain in the comment section to what data they relate and what restrictions are in place.

- No

Are there any other legal issues, such as intellectual property rights and ownership, to be managed related to the data you (re)use? If so, please explain in the comment section to what data they relate and which restrictions will be asserted.

- No

2. Documentation and Metadata

Clearly describe what approach will be followed to capture the accompanying information necessary to keep data understandable and usable, for yourself and others, now and in the future (e.g., in terms of documentation levels and types required, procedures used, Electronic Lab Notebooks, README.txt files, Codebook.tsv etc. where this information is recorded).

The research will not collect any data. However, it will produce software packages, which will be accompanied by appropriate documentation.

Will a metadata standard be used to make it easier to find and reuse the data? If so, please specify (where appropriate per dataset or data type) which metadata standard will be used. If not, please specify (where appropriate per dataset or data type) which metadata will be created to make the data easier to find and reuse.

- No

3. Data storage & back-up during the research project

Where will the data be stored?

The research will not collect any data. However, it will produce software packages. The resulting software will be distributed using a free and open-source license and made available to the general public through long-term archives such as Zenodo.

How will the data be backed up?

As it will be made available online through open access repositories, I don't need to create a separate backup.

Is there currently sufficient storage & backup capacity during the project? If yes, specify concisely.
If no or insufficient storage or backup capacities are available, then explain how this will be taken care of.

- Yes

Everything will be made available online through open access repositories.

How will you ensure that the data are securely stored and not accessed or modified by unauthorized persons?

I won't have any sensitive information in my projects, and all the data will be made though open access repositories.

What are the expected costs for data storage and backup during the research project? How will these costs be covered?

There are no costs for data preserving during the research project.

4. Data preservation after the end of the research project

Which data will be retained for at least five years (or longer, in agreement with other retention policies that are applicable) after the end of the project? In case some data cannot be preserved, clearly state the reasons for this (e.g. legal or contractual restrictions, storage/budget issues, institutional policies...).

All the data that I create (research papers, proofs, software packages) will be retained for the expected period and will be available through open access repositories like arXiv and Zenedo.

Where will these data be archived (stored and curated for the long-term)?

In open access repositories like arXiv and Zenedo.

What are the expected costs for data preservation during the expected retention period? How will these costs be covered?

There are no costs for data preserving during the expected retention period.

5. Data sharing and reuse

Will the data (or part of the data) be made available for reuse after/during the project? In the comment section please explain per dataset or data type which data will be made available.

- Yes, in an Open Access repository

If access is restricted, please specify who will be able to access the data and under what conditions.

The access is not restricted.

Are there any factors that restrict or prevent the sharing of (some of) the data (e.g. as defined in an agreement with a 3rd party, legal restrictions)? Please explain in the comment section per dataset or data type where appropriate.

- No

Where will the data be made available? If already known, please provide a repository per dataset or data type.

In an open-access repository.

When will the data be made available?

Immediately after the end of the project.

Which data usage licenses are you going to provide? If none, please explain why.

It will be open to everyone immediately after the end of the project.

Do you intend to add a PID/DOI/accession number to your dataset(s)? If already available, you have the option to provide it in the comment section.

- Yes

What are the expected costs for data sharing? How will these costs be covered?

There are no expected costs for data sharing.

6. Responsibilities

Who will manage data documentation and metadata during the research project?

I will be responsible.

Who will manage data storage and backup during the research project?

I will be responsible.

Who will manage data preservation and sharing?

I will be responsible.

Who will update and implement this DMP?

I will be responsible.