

FURTHER READING: WHERE TO LEARN MORE?

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VIDEO LECTURES BY COX

In 2018, David Cox (who has coauthored both the books used in this course!) and colleagues held a course on applied algebra. You can find the videos of the lectures here:

<https://faculty.tcu.edu/gfriedman/cbms2018/>.

Examples of particularly accessible lectures:

- Lecture 1 is on the historical aspects of **elimination and resultants**.
- Lecture 4 discusses **numerical algebraic geometry**.
- Lecture 5 is on **computer graphics**.
- Lecture 9 and Lecture 10 are about **chemical reaction network theory**.

LECTURE NOTES ON POLYNOMIAL SYSTEMS

Simon Telen has written a set of very nice lecture notes on **solving polynomial systems** with symbolic and numerical methods, which to a large extent overlaps with our course (but also includes some additional topics and perspectives!). You can find them at [arXiv:2210.04939](https://arxiv.org/abs/2210.04939).

NONLINEAR ALGEBRA

Mateusz Michałek and Bernd Sturmfels have written a book called *Invitation to Nonlinear Algebra*. The first part of it covers the same standard topics in symbolic computation that we did in the beginning of the course (Gröbner bases, elimination, implicitization, etc.), whereas the rest of it gives a short introduction to several hot topics in modern applied algebra, including **tensors**, **toric geometry**, **tropical geometry**, **optimization**, and more.

You can download the book for free here:

<https://mathematik.uni-konstanz.de/working-group-real-geometry-and-algebra/research/invitation-to-nonlinear-algebra/>.

There is also an associated lecture series here:

https://youtube.com/watch?v=1EryuvBLY80&list=PLRy_Pn1LtSpejKLC1qbrWwBxGKxx33301.

METRIC ALGEBRAIC GEOMETRY

There is a brand new (and freely available!) book by Paul Breiding, Kathlén Kohn, and Bernd Sturmfels on the intersection of algebraic geometry and differential geometry/topology, from an applied and computational point of view:

<https://link.springer.com/book/10.1007/978-3-031-51462-3>.

The book starts with a very accessible overview of the field in Chapters 1–2 (you will recognize the Euclidean distance problem from Weeks 5 and 7 as a central example), and then gives a nice introduction to computational algebraic geometry that overlaps to a large extent with our course in Chapter 3. After this, the book moves on to study a broad range of topics, including abstract notions such as **curvature**, **homology**, and **characteristic classes**, as well as exciting applications such as **algebraic statistics**, **tensors**, **computer vision**, and **machine learning**.