

Math 996, Fall 2013

Final Project (First Announcement)

Summary

Read a current research article in combinatorics, give a short talk on it to an audience of fellow graduate students, attend everyone else's talk and provide detailed constructive criticism on one other student's talk.

Article selection

Each student enrolled in Math 996 should meet with Jeremy individually to select a paper to read. A list of possible papers (by no means exhaustive) is below. You can also suggest a paper you like: search MathSciNet for published papers (requires KU login) and the arXiv for preprints. The paper should be one you have not read before and are not reading for another course. You must get final approval from Jeremy (two students cannot read the same article). You should have your article chosen by no later than **Friday, November 15**.

Talks

The goal of your talk is to help a fellow graduate student to become familiar with the main ideas of the article. Of course, you need to understand the paper well yourself in order to explain it to others, but you do not necessarily have to prove anything in your talk (and you probably won't have time to do so anyway). You should rehearse your talk at least once, if not several times, before presenting it.

Logistics

There are 8 students enrolled in the class, so we need four 50- to 60-minute sessions (so as to include time for questions). I would like to use class days on Monday 12/9 and Wednesday 12/11 and the Combinatorics Seminar time slots on Friday 12/6 and Friday 12/13 (3-4 PM, 408 Snow). Another option is to use the allotted time for the final exam (Wednesday 12/18, 7:30 AM –10:00 AM), but this would be a last resort. If you cannot, or would prefer not to, attend the seminar on these days, contact me ASAP.

Constructive criticism

Each student will be responsible for providing a written critique of (at least) one other student's talk. I will assign critiquers after everyone chooses their articles. In your critique, you should address these questions:

- What did the speaker explain as the major themes (e.g., definitions, methods, or theorems) of the article?
- What do you now know that you didn't 20 minutes ago?
- What other mathematical ideas came to mind as you listened to the talk?
- What else would you like to know?
- What could the speaker have done differently to help you understand the subject?

As always when giving constructive criticism to a mathematical colleague, you should be specific, candid, and respectful. For example, here are some possible comments, arranged from most helpful to least helpful.

- Very helpful: "I get that a pseudoquasihypermatroid is intended to model pseudoquasihyperlinear independence, but I don't see how Axiom 1B reflects that?"
- Helpful: "I didn't understand the motivation behind the definition of a pseudoquasihypermatroid."
- Sort of helpful: "I didn't understand pseudoquasihypermatroids."
- Less helpful: "Interesting talk, I liked it."

Simplicial complexes

MR0971798 (89m:52009)

Björner, Anders(S-RIT); Kalai, Gil(IL-HEBR)

An extended Euler-Poincaré theorem.

Acta Math. 161 (1988), no. 3-4, 279–303.

MR2191645 (2006h:05239)

Nevo, Eran(IL-HEBR-IM)

Algebraic shifting and basic constructions on simplicial complexes.

J. Algebraic Combin. 22 (2005), no. 4, 411–433.

MR1926878 (2003j:15017)

Duval, Art M.(1-TXEP); Reiner, Victor(1-MN-SM)

Shifted simplicial complexes are Laplacian integral.

Trans. Amer. Math. Soc. 354 (2002), no. 11, 4313–4344.

MR0690055 (84f:06004)

Björner, Anders; Wachs, Michelle

On lexicographically shellable posets.

Trans. Amer. Math. Soc. 277 (1983), no. 1, 323–341.

Claimed by Ken

MR1633767 (99h:13017)

Eagon, John A.(1-MN-SM); Reiner, Victor(1-MN-SM)

Resolutions of Stanley-Reisner rings and Alexander duality.

J. Pure Appl. Algebra 130 (1998), no. 3, 265–275.

Gröbner bases and initial ideals

MR2465398 (2010c:13021)

Hibi, Takayuki(J-OSAKTGI-M)

Gröbner basis techniques in algebraic combinatorics. (English summary)

Sém. Lothar. Combin. 59 (2007/10), Art. B59a, 22 pp.

MR1185786 (94a:13012)

Herzog, Jürgen(D-ESSN); Trung, Ngô Việt(VN-HMI)

Gröbner bases and multiplicity of determinantal and Pfaffian ideals.

Adv. Math. 96 (1992), no. 1, 1–37.

MR1390693 (97h:13023)

Conca, Aldo(I-GENO); Herzog, Jürgen(D-ESSN); Valla, Giuseppe(I-GENO)

Sagbi bases with applications to blow-up algebras.

J. Reine Angew. Math. 474 (1996), 113–138.

MR1229634 (95b:68061)
Becker, Thomas(D-PASSMI)
Standard bases in power series rings: uniqueness and superfluous critical pairs.
J. Symbolic Comput. 15 (1993), no. 3, 251–265. **Claimed by Zach**

MR1948090 (2003j:13036)
Conca, Aldo(I-GENO)
Reduction numbers and initial ideals.
Proc. Amer. Math. Soc. 131 (2003), no. 4, 1015–1020. **Claimed by Rob**

MR1973955 (2004h:13030)
Babson, Eric(1-WA); Onn, Shmuel(IL-TECH); Thomas, Rekha(1-WA)
The Hilbert zonotope and a polynomial time algorithm for universal Gröbner bases.
Adv. in Appl. Math. 30 (2003), no. 3, 529–544.
See also <http://ie.technion.ac.il/~onn/Highlights/High2/>

Irving, Corey; Schenck, Hal
Geometry of Wachspress surfaces.
<http://arxiv.org/abs/1306.1445>

Claimed by Nitin

Free resolutions

MR1647559 (99g:13018)
Bayer, Dave(1-CLMBBN); Sturmfels, Bernd(1-CA)
Cellular resolutions of monomial modules.
J. Reine Angew. Math. 502 (1998), 123–140. **Claimed by Alex**

MR1856984 (2003a:13016)
Reiner, V.(1-MN-SM); Welker, V.(D-TUB)
Linear syzygies of Stanley-Reisner ideals.
Math. Scand. 89 (2001), no. 1, 117–132. **Claimed by Tony**

MR1932716 (2004c:13020)
Peeva, Irena(1-MIT)
Hyperplane arrangements and linear strands in resolutions.
Trans. Amer. Math. Soc. 355 (2003), no. 2, 609–618. **Claimed by Billy**

MR1911210 (2003d:05055)
Miller, Ezra(1-MIT)
Planar graphs as minimal resolutions of trivariate monomial ideals.
Doc. Math. 7 (2002), 43–90.

MR1882136 (2003b:13023)
Novik, Isabella(1-WA); Postnikov, Alexander(1-MIT); Sturmfels, Bernd(1-CA)
Syzygies of oriented matroids.
Duke Math. J. 111 (2002), no. 2, 287–317.

Schubert varieties

MR1051089 (91c:14061)

Lakshmibai, V.(1-NORE); Sandhya, B.(6-MATSCI)

Criterion for smoothness of Schubert varieties in $Sl(n)/B$.

Proc. Indian Acad. Sci. Math. Sci. 100 (1990), no. 1, 45–52.

Binomial ideals in combinatorics

MR3047017

Manjunath, Madhusudan(D-SAAR); Sturmfels, Bernd(1-CA)

Monomials, binomials and Riemann-Roch.

J. Algebraic Combin. 37 (2013), no. 4, 737–756.

MR1896344 (2003b:13041)

Cori, Robert(F-BORD-LB); Rossin, Dominique(F-POLY-LI); Salvy, Bruno(F-INRIA-AG)

Polynomial ideals for sandpiles and their Grbner bases.

Theoret. Comput. Sci. 276 (2002), no. 1-2, 1–15.

Claimed by Logan

MR2052943 (2005a:05066)

Postnikov, Alexander(1-MIT); Shapiro, Boris(S-STOC)

Trees, parking functions, syzygies, and deformations of monomial ideals.

Trans. Amer. Math. Soc. 356 (2004), no. 8, 3109–3142.

Dochtermann, Anton; Sanyal, Raman

Laplacian ideals, arrangements, and resolutions

<http://arxiv.org/abs/1212.6244>