

Optima@ISMP

01 Optimal History

02 Today's plenaries

03 Alberto Caprara

04 Optimal Lunch Break

05 The Hit

Editorial

"A mathematician is a device for turning coffee into theorems" – and the blacker the coffee, the deeper the theorem. Savor yours from our ISMP mug with its *sandblasted logo* for 10€ ... we give a "a theorem a day or money back" guarantee (lemmas not counting). Get inspired by browsing through your *hardcover copy* of the 460 pages "Optimization Stories" book! A bargain for only 35€! Just like teddy "Martin" with his removable ISMP mini T-shirt. Lightweight, heavily compressible, and only 10€, Martin will uncomplainingly fit into any suitcase and (re-expanded) delight your kids. Do you envy Martin's T-shirt? Get one in your size (lady available) for just 10€ or dress-up in one of our polo shirts with *embroidered logo* for 20€. If you really twist our arms we might sell you one of the orange color T's usually reserved for our staff. Just don't wear them at the conference or know the Berlin ISMP Guide by heart. All these invaluable collector's items are waiting for you at the reception desk. Don't miss out on stopping by!

Ralf Borndörfer and
Sebastian Stiller



Spreepark Berlin (Photo: Christoph Eyrich)

"We have 15 open positions at the moment"

TomTom is one of the leaders in portable navigation systems and seemingly everywhere at the ISMP. Yesterday, they explained in their session what makes modern navigation systems modern and what makes TomTom special. Right before, we met Heiko Schilling, Head of Navigation Engine Development at TomTom, to talk a bit about the future of navigation devices and the maths inside.

optima@ismp: What are the main developments in the navigation business?

Schilling: Static routing is out. This is something everyone can and does. The interesting development is dynamic routing. We have 70 million customers and about 80 percent of them are using the possibility to upload their GPS traces. Every two minutes, we get the position of the device, and thus we get more than four billion speed measurements each day. From this data, we compute new routes that are then updated on the device, and we also try to learn as much as possible from that data about the properties of the road network, for instance its topology, angles and so on.

optima@ismp: Does that imply that

the main computation is now done on servers rather than on board?

Schilling: Yes and no. The client has to be intelligent enough to compute reliable routes fast, but in practice, we will more and more share the computation between client and server. However, I do not expect that in the next future, everything is done on servers.

optima@ismp: What are other developments?

Schilling: We are planning optimal routes for the individual user. But what about the impact for the whole system? This is by far not a new question, we analyzed the problem of centralized traffic and navigation control already in the 1990s at TU Berlin. But it will grow more and more important in the next years. This also affects the planning of whole traffic system – streets, urban traffic control. In that sense, navigation will play a political role. We are already in European committees for the general planning of future traffic systems.

One other thing which is interesting for both the individual and the entire society is the development of autonomous cars – the car could drive autonomously, the driver is only there for backup. Google does

quite a lot in that question. I think in about ten years, we could have these systems in new cars. And this could have a huge impact on how we use cars: one can think of a kind of individualized public transport system. Imagine a car sharing fleet where you can "call" the car and it comes automatically to your door. This could be possible in the next, say, 20 years.

optima@ismp: The massive TomTom commitment during the ISMP shows that you are trying to hold close contact with research.

Schilling: That is true; there are at the moment about ten years between the publication of a paper and the implementation of the software. I have at the moment 15 open positions here in Berlin, and I am always looking for mathematicians and developers in the relevant fields. In the second half of the next year, we will organize a developer's conference in Berlin, to get in touch with people who want to help from outside to enhance our software or to use it for research. Already now you can have academic licences of our software library including the maps for research for free if you send us a proposal about what you are planning to do.

Optimal Reading

[a] Cambridge University Press is the publishing business of the University of Cambridge – and it is the world's oldest publishing house, dating from 1534. There are quite a lot of titles in the field of optimization, both discrete and continuous.

Michael C. Delfour from the Université de Montréal produced a one-term course for undergraduates which gives an *Introduction to Optimization and Semidifferen-*

tial Calculus. This is a treatment of semidifferential calculus in the context of optimization introducing basic notions in convex analysis (convexification, duality, linear and quadratic programming, two-person zero-sum games, Lagrange primal and dual problems, semiconvex and semiconcave functions).

Alfio Borzi from the University of Würzburg and Volker Schulz from the University of Trier wrote *Com-*

putational Optimization of Systems, a book that offers a combined treatment of PDE-constrained optimization and uncertainties in theory and practice and an extensive discussion of multigrad optimization to graduate students in PDE-constrained optimization.

For more information, please visit the Cambridge University Press booth in the Lichthof of the TU or check out www.cambridge.org

Today's Plenaries

- Richard Baraniuk: *Compressive Signal Processing*, 09.00–09.50, H 0105
- Amin Saberi: *Rounding by Sampling and Traveling Salesman Problems*, 17.00–17.50, H 0105
- Michael P. Friedlander: *Data fitting and optimization with randomized sampling*, 17.00–17.50, H 0104

Random Picks

- Mixed Integer Programs instead of TV programs: video on demand services seen from an optimization point of view. David Applegate: *Using an exponential potential function method to optimize video-on-demand content placement*, 11.00–11.25, H 3008
- Will the mysteries inside the presolver of Gurobi be revealed? Robert Bixby: *Presolve for linear and mixed-integer programming*, 11.30–11.55, H 0110

- What have supply chain management and game theory do with each other? Tiru Arthanari: *Game theory and supply chain management: A survey*, 13.15–13.40, MA 043

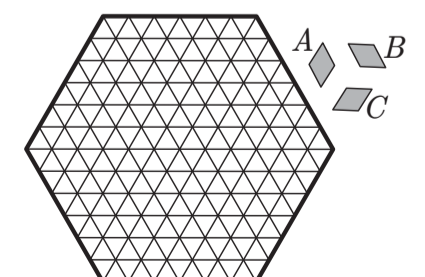
- Solving the cut packing problem for arbitrary graphs exactly. Martin Bergner: *Packing cuts with column generation*, 13.15–13.40, H 2032

- Planning a future algorithm for convex minimization based on VU-space decomposition. Robert Mifflin: *A first step in designing a VU-algorithm for nonconvex minimization*, 15.15–15.40, H 1012

- Replacing components in large telecommunication networks means that you have to shut down parts of the system. How do you repair with as few disturbance as possible? Daniel Karch: *Fiber replacement scheduling*, 16.15–16.40, H 3503

The Puzzle

[a] Consider this regular hexagon, divided by a triangular grid:



Obviously, the hexagon can be tiled without any gaps using the three shown rhomboids *A*, *B*, *C*. Can you construct a tiling such that the numbers of tiles of type *A*, *B*, *C* are not all the same?

Optimal History

[a] After coming from the backwaters of Westprussia (where he worked as a high school teacher) to Berlin, Karl Weierstraß became famous for his high standards in proofs, in particular in analysis, which lead to a review of large parts of analysis, for instance the *Dirichlet Principle* or Jakob Steiner's Proof of the Problem of Dido. Jürgen Sprekels is predestinated to talk about all that: He is a renowned Professor for Applied Analysis at the HU Berlin and the director of the Weierstrass Institute for Applied Analysis and Stochastics (WIAS) in Berlin.

First historical lecture on Thursday:

- Jürgen Sprekels:

Karl Weierstrass and optimization, 17.00–17.25, H 1012

Hermann Minkowski is not only known as a mathematical pioneer in relativity (and teacher of Albert Einstein), he was also a extremely creative mathematician who published 1896 his influential book *Geometrie der Zahlen* (Geometry of Numbers), a study of convex bodies, lattices and optimization in high dimensions that "formed a new band between analysis of the infinite and number theory", as he told himself in a note. Martin Grötschel – how doesn't know him? – will talk about that.

Second historical lecture on Thursday:

- Martin Grötschel:

Hermann Minkowski and convexity, 17.30–17.55, H 1012

Today's Weather

08:00 ☀ 16°C / 60.8°F
11:00 ☀ 20°C / 68.0°F
14:00 ☀ 23°C / 73.4°F
17:00 ☀ 23°C / 73.4°F
20:00 ☀ 21°C / 69.8°F



Freischwimmer and Club der Visionäre (Photo: Christoph Eyrich)

Optimal Spare Time

[a] Friedrichshain, in the former eastern part of Berlin, is the young and hip center of Berlin – at least many people think so. It's the home of many students, trendy guys working "in media" and the pixel moving Web-2.0-crowd. Some of them regard this part of Berlin as a big canvas for their graffiti, in tradition of the Berlin Wall that disappeared almost everywhere. In Friedrichshain however, one can see a 1.3 km part of the Wall, the East Side Gallery along *Mühlenstraße* (next to the Ostbahnhof). (Some less colorful parts can be visited in *Bernauer Straße* in Prenzlauer Berg; there is also Berlin Wall Memorial.)

In Friedrichshain, you can also find a lot of infrastructure to supply inhabitants and tourists with coffee, eating and booze, mainly around *Boxhagener Platz* and *Simon-Dach-Straße*. However, on the other side of the Spree, one can find two places next to the water that are hip but still hidden: the *Club der Visionäre* and the *Freischwimmer*. From there, one can start a longer walk through *Treptower Park* to the east to visit the huge *Soviet War Memorial* and, a bit further,

the magical *Spreepark Berlin* which is to Berlin what Coney Island is to New York: Some years ago, an investor planned an amusement park there, but he became insolvent. Today, the observation wheel is rusting and nature finds its way between plastic dinosaurs and other attractions. Unfortunately, the place is usually locked, but there are regular conducted tours that can be booked online; just check the website below.

- Club der Visionäre
Am Flutgraben 1, 12435 Berlin (U Schlesisches Tor)
Mon–Fri from 14.00, Sat and Sun from 12.00,
www.clubdervisionaere.de
- Freischwimmer
Vor dem Schlesischen Tor 2a, 10997 Berlin (U Schlesisches Tor)
Mon–Fri from 14.00, Sat and Sun from 10.00
www.freischwimmer-berlin.de
- Spreepark
www.berliner-spreepark.de
For more information and maps, please refer to the ISMP 2012 Berlin guide!

“The Opening Ceremony was the Hit!”

[a] The largest ISMP ever, hot topics and hot weather – we wanted to talk a bit about the ISMP 2012 with chief organizer Martin Skutella from TU Berlin.

optimal@ismp: Let's take stock. What do think about ISMP 2012 after two years of work and three days of conference?

Skutella: This ISMP is a fantastic success. More than 2000 participants is a benchmark that is a surprise to all of us.

Thinking about details, I am especially proud of the opening ceremony which was really a hit. Many participants gave me afterwards an enthusiastic feedback. Everything matched at that evening, even the orchestra and the audience. I talked afterwards to some members of the orchestra – I played there the Cello 15 years ago – and they told me they loved this stimulating audience.

optimal@ismp: Is there something that could be done better in the future?

Skutella: On Monday, the weather was too good, it was simply too hot. But we tried to solve the problem, we sent students to buy fans for the seminar rooms (laughs). To be serious: The Mathematical Optimization Society could display its work and activities much better. I am sure that the participants and the MOS could benefit from that a lot. There

could for instance be a booth next to the Reception. A short story from the last days: standard participants have in the conference fee included a temporary membership in the MOS. But if you are a student, then this is not the case. We had a student coming to us, he wanted to become a member – and in that second, we really wished to have a MOS information desk!



Opening ceremony (Photo: Andreas Loos)

optimal@ismp: What trends do you see?

Skutella: This ISMP shows more and more the whole scope of mathematical optimization. This year, we invited for instance the constraints

In memoriam of Alberto Caprara (1968–2012)

(Andrea Lodi) Alberto Caprara passed away on April 21 while he was climbing one of the mountains close to Bologna, the “Corno alle Scale”. That mountain is part of the Apennines, a chain definitely less impressive than the Alps but often breathtaking in terms of landscape and, sometimes, still challenging to climb. For Alberto, reaching the “Corno alle Scale” was an easy and short ride from his place, and he used to go there very frequently. So frequently that in the websites in which climbers and mountain addicted exchange stories and tips about their passion, Alberto is referred to as the “Custode”, roughly the guardian, of the East side of the “Corno alle Scale”. He used to be very proud of that nickname.

Alberto Caprara has been an impressively talented mathematician, with strong interests and results in Mathematical Programming, Theoretical Computer Science, Computational Biology, and probably I forget some. He was naturally attracted

by clean and especially challenging mathematical questions, but he was not afraid of jumping into applications, if one of his friends and colleagues was able to expose a good reason for. Thus, Alberto has alternated theory and applications like very few of us, being able to give, in both sides, innovative, deep and seminal contributions. This is true for his work on cutting plane theory, 0,1/2 and split cuts, on approximation algorithms for bin packing, on complexity of sorting by reversals, and on railways applications, just to mention a few of his very successful interests.

Alberto's talent and brilliant ideas will then be highly missed by the scientific community. However, he is missed even more at a personal level. This is testified by the website albertocaprara.people.ing.unibo.it/gbook.php where Alberto's friends, students and colleagues shared their sorrows for his death. Alberto's warm and open smile, his honesty and unassuming attitude, together



Alberto Caprara (Photo: Andrea Lodi)

with his brilliant and funny talks in which he tried to explain in his own way Italian politics to non Italians will be impossible to forget. For those who had the chance of knowing Alberto personally and in particular for the Aussois crowd, witnessing his passion for the mountains, a bit of relief is given by knowing that he has spent the last moments of his life doing something he really loved. Nevertheless, it is very hard to believe that we have lost the chance of chatting, discussing, working and laughing with such an incredible person.



Soviet War Memorial in Treptower Park (Photo: Christoph Eyrich)

programming community to take part, and this gave real benefit to the whole conference, not only because of the many links between CP and integer programming. And this development is not at an end: I could imagine for the ISMP 2015 more sessions jointly organized by members from different branches of mathematical optimization. The most interesting developments often happen at the interface of different areas.

optimal@ismp: The 2000 participants at the ISMP 2012 have more than 1700 talks to choose from. The average participant will probably listen to about one percent of the talks. Is there a danger of offering too much – or is the ISMP “too big to fail”?

Skutella: Well, I think the ISMP is the World Congress of Optimization. The enormous size of ISMP in terms of talks is a minor problem for the participants – I would rather say it is a big chance since everyone has a large portfolio of talks to choose from. I do, however, see problems in terms of organizing such a large symposium. In Berlin, we are in the lucky situation to have appropriate facilities for running 40 parallel streams, but this might be more difficult at other places. But then, on the other hand, the various amenities of Berlin have made ISMP 2012

so large. I would be surprised if ISMP always maintains that size in the future.

optimal@ismp: Will the ISMP 2015 be an ISMO 2015?

Skutella: That's a good question. On the one hand, the name ISMP is an established brand in the community (and that is why we did not change the name for 2012). On the other hand, we would go with the time if we had an ISMO 2015 – the renaming of the MPS to MOS points in this direction. But this is a question the next organizing committee has to discuss with the MOS.

See You in Pittsburgh!

[a] At the MOS business meeting yesterday (which turned out to be shorter than some expected), it has been announced that the ISMP 2015 will be in Pittsburgh – so, in three years, Egon Balas can come by walking instead of taking the plane. Both the University of Pittsburgh and the Carnegie Mellon University have a long tradition in optimization and host a large and internationally well-known optimization community. So save the date: July 26 to August 1, 2015 – to see all again in Pittsburgh!

A Small Selection ...

[a] International food in Berlin? Here you get some general tips where to go for. (Much more details can be found in the ISMP 2012 Berlin Guide.) Kosher food can be found around *Oranienburger Straße* and *Tucholskystraße* (S Oranienburger Straße) or around *Fasanenstraße* (not far from TU Berlin); around *Tucholskystraße* was the former poor Jewish Quarter of Berlin, the Scheunentorviertel. Excellent Indian or Turkish food can be found in *Bergmannstraße* (U Gneisenaustraße) or in and around *Oranienstraße* (U Moritzplatz), both in Kreuzberg. And a good place to search for food of all kinds is also the district *Schöneberg*, in particular *Goltzstraße* and *Akazienstraße* (U Eisenacher Straße).

Questions? Comments? Remarks?
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