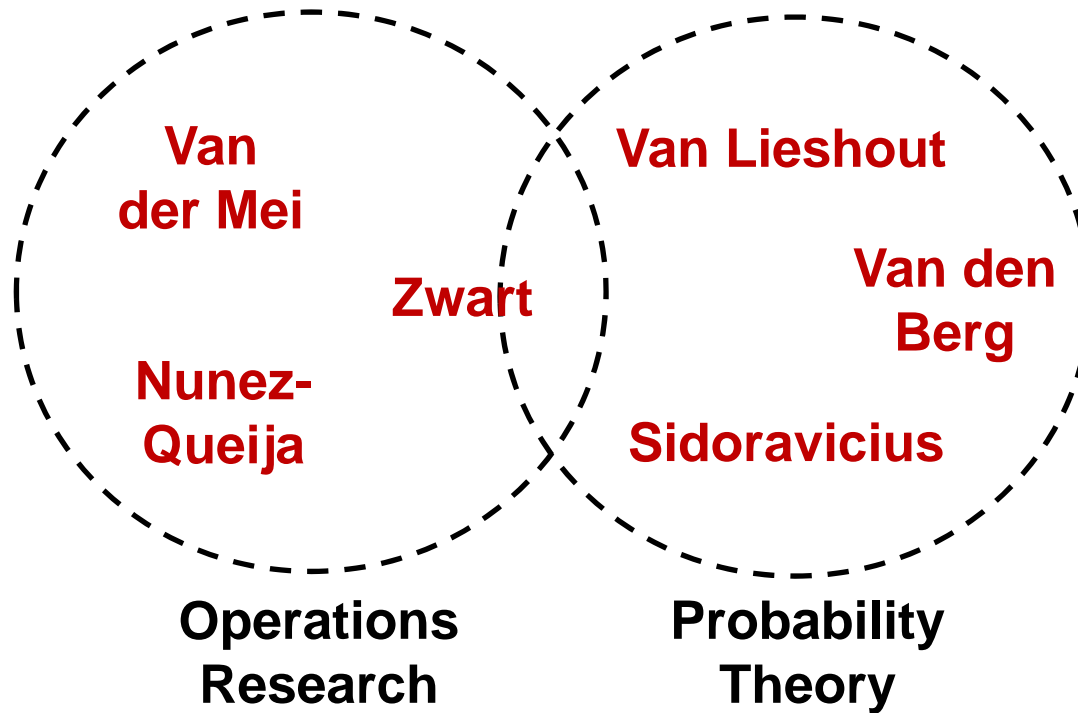


Probability and Stochastic Networks (PNA2)

Probability and Stochastic Networks (PNA2)



Composition



6 seniors (4.8FTE; 5 full professors, 1 associate professor), 7 PhD students, 4 PDs, 8 PhD students outside CWI, 7 seniors seconded staff

2005

2006

2007

2008

2009

2010

Probability and Stochastic Networks (PNA2)

Queueing Theory and Stochastic Processes

Quality of Service in Communication Networks

Percolation and Mathematical Physics

Stochastic Geometry and Image Analysis

Societal Logistics

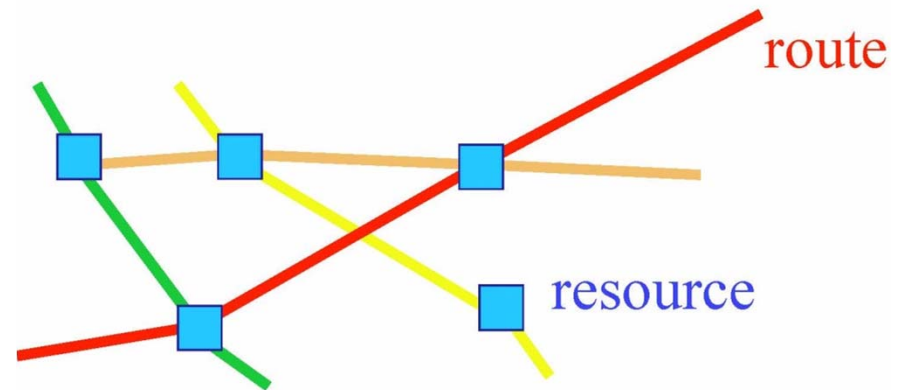
Revenue Management

merger

Queueing Theory and Stochastic Processes

Topics:

- Scheduling
- Bandwidth sharing
- Analysis of polling models



Major achievements:

- Diffusion approximation of general bandwidth sharing networks, computable in polynomial time
- Unifying theory of polling models in heavy traffic

Challenges:

- Modeling and analysis of spatial stochastic processes
- Queueing models with multiple layers



Quality of Service of Communication Networks

Topics:

- Wireless networks
- Peer-to-peer networks
- QoS in large ICT service chains (with SEN3)

Major achievement:

- Algorithms for efficient traffic splitting for mobile networks with concurrent access

Challenges:

- Algorithms for optimal splitting for streaming traffic
- Development of SLA calculus for composite services



THALES



Societal Logistics

Topics:

- Efficient planning of ambulance services (with PNA1)
- Performance planning and optimization of call centers
- Smart navigation algorithms (with PNA1)

Achievements:

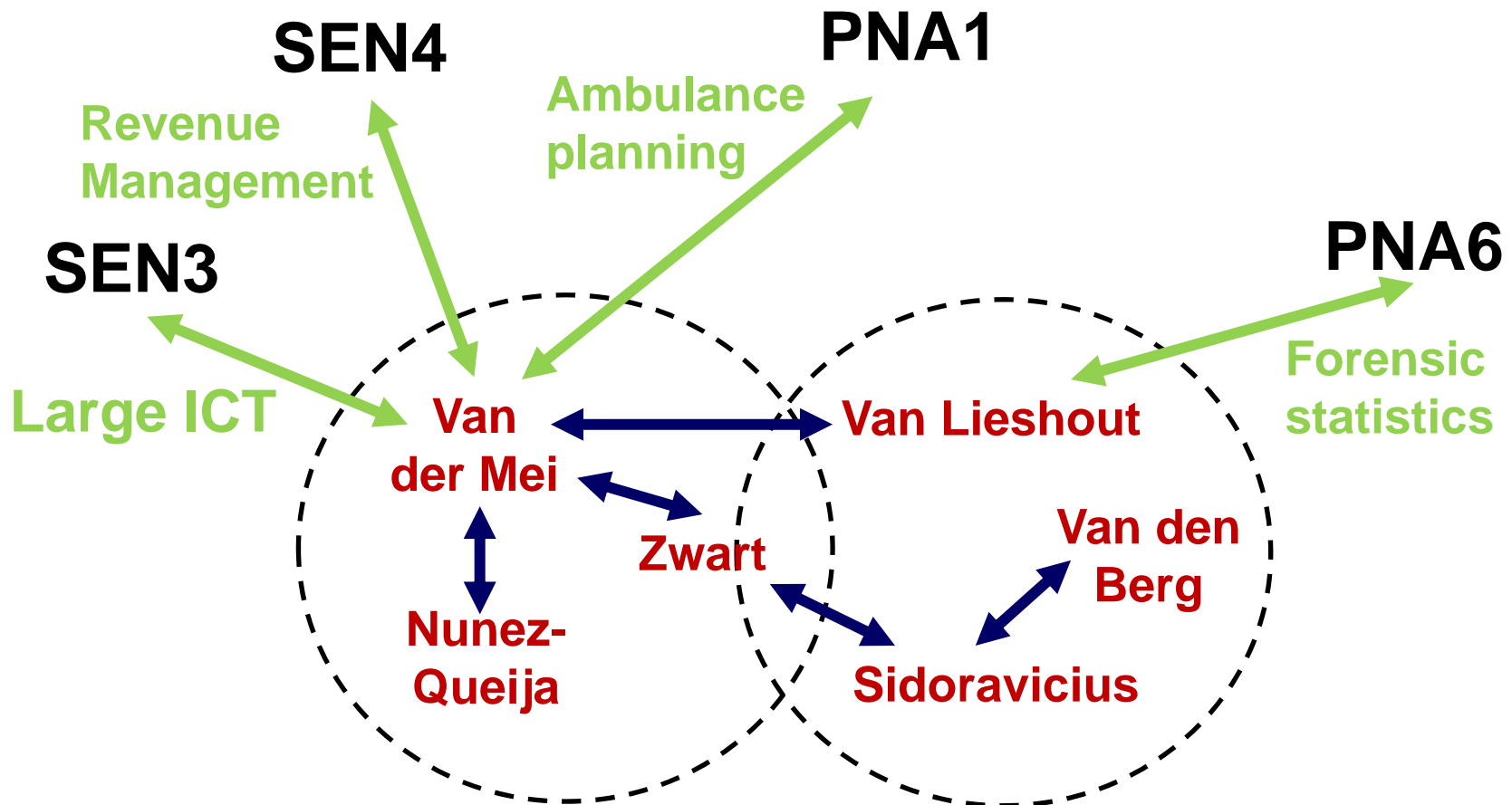
- Powerful asymptotic results on performance of large call centers
- New planning methods for ambulance services

Challenges:

- Algorithms for dynamic ambulance management
- Inclusion of results from algorithmic game theory (with PNA1) and from agent-based systems (with SEN4)



Collaborations in CWI



Outreach Activities

Probability and Stochastic Networks (PNA2)

Organisation of 29th European Study Group Mathematics with Industry at CWI

Popular-scientific lectures for broad audience, for example

- nationale wetenschapsdag
- junior Mathematics Olympiad

Interviews on national radio, newspapers and professional literature

De PAROOL ZATERDAG 12 JULI 2008

Wiskunde redt levens

Kansberekening en modellering moeten ambulanceplanning in Amsterdam verbeteren.

JOHN ZANDHUIS



Doorschijnere voorspellingen met behulp van statistiek kunnen onze ambulances efficiënter voor minder geld. **renew**

Rais d'woord wiskundigen uit heel Europa lopen komende week in Amsterdam rond. Daarnaast is te danken aan het vijfde Europese Wiskunde Congres (EJC) in de RAI. Hoewel wiskunde... daar doet toch alleen graaiet aan? Dofjane nman, maar wil een beetje verslonden?

Erik van der Mei, hoogleraar aan de Vrije Universiteit en afdelingshoofd bij het Centrum Wiskunde & Informatica (CWI), keert het beeld, maar hij is het er niet mee eens. "Wiskunde wordt vaak in een teken terecht geplaatst, maar eigenlijk doe je het overal om je heen."

Van der Mei loopt over van voorbeelden waarin wiskunde belangrijk is: de TomTom, de klapschaar, het gas-netwerken de NS-Eurotoegif. Het project dat hij uitvoert

medewerkers aanwezig. Deze planning staat bevoordelend vast. Er zijn al twee versies: tussen doordeweekse dagen en het weekend. Door scherpere voorspellingen te doen over het aantal ongelukken kan de kwaliteit van de dienstverlening aanzienlijk verbeteren tegen lagere kosten."

Voorspellingen doet Van der Mei met behulp van statistiek en stochastiek, kansrekening. Hij heeft van de regionale ambulancecentra gegevens gekregen van de gebeurtenissen. Hij weet precies wanneer en hoe vaak ambulances

Uit eigen ervaring

De ambulancezorg in Nederland is op dezelfde statistische wijze gekend als in Amsterdam. Toch is de paging van de regio-ambulance in de hoofdstad on-

'Ambulance is eerder ter plekke met een betere

Highlights

Prizes and awards:

- INFORMS Erlang Prize (Zwart, 2008)
- Van Dantzig prize (Borst, 2005)
- Best paper award ACM Sigmetrics (Simatos, 2010)
- Best paper award IFIP Performance (Zwart, 2010)
- Gijs de Leve prize (Dieker, 2009)
- Nicholson prize (Zhang, 2010)

Prestigious grants:

- VIDI grant (Zwart)
- 3x NWO Open Competition (vdBerg, vLieshout, vdMei)
- Prestigious grants from Clay and ESF (Sidoravicius)
- NWO Casimir grant (vdMei, Hoekstra)
- 2x ERCIM fellowship (vdMei, vLieshout)

Other:

- 200+ papers, 100+ invited lectures
- 10 PhD theses finished, 8 MSc interns
- 12 associate and 1 area editorship and 2 editorships
- Organization >20 (inter)national conferences

SWOT Analysis

Strengths:

- Strong and visible group with broad expertise
- Firm imbedding in both academic and industrial communities
- Well-balanced mixture of curiosity-driven and application-driven research
- Significant funding from both academia and industry

Weaknesses:

- Collaboration between different branches developing at a too slow rate

SWOT Analysis

Opportunities:

- Momentum in macroscopic analysis in Mathematical physics and stochastic networks
- Dynamic pricing and Revenue Management
- Dinalog institute on service supply chains
- Health care logistics rapidly gaining momentum

Threats:

- Decreasing funding levels of Mathematics
- Difficulty to recruit talented staff in the Netherlands

Strategy:

Constant renewal of research direction

Keep funding levels high by focusing on multi-disciplinary collaborations, both in academia and industry

Challenges

Combining OR and Statistics:

- Revenue Management
 - PhD projects (SEN4, PNA1)
 - Platform Pricing & Revenue Management (with VU and ORTEC)
- Sensor-network platforms
 - PhD project (funding Agentschap.nl)



Combining OR and Probability:

- Impact of spatial dynamics on congestion
- Road-traffic networks (macroscopic modelling)
- Techniques from statistical physics, OR and economics

Funding Sources

Probability and Stochastic Networks (PNA2)

NWO (VIDI, GLANCE, Open Competition, Casimir, Valorization grant)

ESF

NSF

CWI bonus

BRICKS

Senternovem

Agentschap.nl

ICTRegie

EU 7FP

ERCIM

IBM

France Telecom

KLM

National Railroads