

## Faculty of Science and Engineering

### Profile report: Game theory and strategic decision making in dynamic systems/ Speltheorie en strategische besluitvorming in dynamische systemen

- Discipline: Game Theory; Optimization; Systems and Control; Industrial & Management Engineering
- Level: Assistant (tenure track)
- Focus: Research
- Fte: 0,8-1,0 fte

#### 1. Scientific discipline

Game theory and strategic decision making in dynamic systems focuses on the development of mathematical models of cooperation and competition among multiple decision-makers in a dynamic setting (aka multi-agent systems), their analysis, design, and implementation in engineering and management as well as financial and economic practices.

#### 2. Vacancy

This position is opened by the board of the Faculty of Science and Engineering (sectorplan II – Engineering) and will be embedded in the institute Engineering and Technology Institute (ENTEG), basic unit Optimization and Decision Systems (ODS). The position falls within the framework of the faculty's career system [Career Paths in Science and Engineering](#). As the focus domain of the position is research, the criteria of the career path with a focus on research apply. Please see the link for more information.

#### 3. Selection committee (BAC)

- Prof. dr. B. Jayawardhana, Professor Mechatronics and Control of Nonlinear Systems, Scientific director, ENTEG;
  - Prof. dr. G.J.W. Euverink, Professor Products and Processes for Biotechnology in the Biobased Economy, Educational director, ENTEG;
  - Prof. dr. D. Bauso, Professor Optimization and Decision Systems, ENTEG;
  - Prof. dr. Maria E. Valcher, Professor Systems and Control at Università di Padova, Italy.
  - Prof. dr. Evrim Ursavas, Professor Energy Logistics, FEB, RUG
  - Prof. dr. C. De Persis, Professor Automatic Control, ENTEG
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- Student (will follow)

#### Advisors:

- Prof.dr. Jasper Veldman, professor Technology and Operations Management, FEB, RUG
- Dr. Ashish Cherukuri, assistant professor Optimization and Decision Systems, ENTEG;
- F. Salverda, HR advisor, ENTEG;
- Dr. K.E. Voskamp, Institute manager, ENTEG.

#### **4. Area of expertise**

The successful candidate is expected to conduct research in the areas of Operations Research, and Systems and Control, and Optimization and Game Theory with engineering, economic, socio-technical applications.

Quantitative and mathematical methods might involve convex/ distributed/ stochastic/ robust optimization, optimal and robust control design for (non)linear stochastic systems, data-driven model-free methods.

The application domains include, but are not limited to, energy, transportation and socio-technical systems, as well as logistic systems, vehicle routing and task assignment, supply chain management, decision-support for manufacturing systems. It is particularly encouraged that the applicant's research areas have clear and close connection with various engineering data or processes in the context of smart cities, modern transportation, flow networks, energy systems, communication and computer networks, cyber-physical networks and manufacturing and service.

#### **5. Embedding: institute (and base unit)**

The candidate will be embedded in the research institute ENTEG ([www.rug.nl/enteg](http://www.rug.nl/enteg)).

ENTEG is the engineering science and technology institute of the Faculty of Science and Engineering (FSE) of the University of Groningen (UG). ENTEG's research is highly multidisciplinary in nature and focuses on fundamental and engineering research on the development of new and innovative processes and products for a wide range of product sectors. The aim is to contribute to a smart and circular society. The research of ENTEG is conducted in three key research domains:

- Green chemical engineering, circular and sustainable product technology;
- Optimization, systems & control technology; and
- Mechanical engineering and robotic technology.

ENTEG staff strongly links to various educational programmes, including the Mechanical Engineering, Systems and Control, Industrial Engineering and Management, and Chemical Engineering degree programmes.

The candidate is expected to set up their research line within the basic unit Optimization and Decision Systems (ODS). The mission of this research group is to promote a modern vision of optimization and decision systems as cross-disciplinary areas intersecting Operations Research Engineering, Systems and Control Engineering, Computational Social Science and Quantitative Economics. Among the goals of this research group is the one of developing and supporting novel engineering methods based on optimization, systems and control, and game theory to incentivise cooperation among selfish decision-makers in engineering applications. The main findings will address modelling / understanding of socio-technical systems in different applications domains including: Operations Research, Transportation, Logistics, Inventory Control, Cybersecurity, Pricing, Opinion dynamics and diffusion in Social Networks. This research group complements and support joint research especially with other two groups in ENTEG, Discrete Technology & Production Automation (DTPA) and Smart Manufacturing Systems (SMS).

## **6. Local and (inter)national position**

The research related to this vacancy is supposed to take a prominent role in the cross-disciplinary research theme on Data Science and Systems Complexity (DSSC) within the Faculty of Science and Engineering. This involves scholars from diverse disciplines such as mathematics, computer science, artificial intelligence, systems and control, engineering, and astronomy. In addition, the research activities in Systems and Control at UG are part of the Jan C. Willems Center for Systems and Control, which fosters collaboration among its members both at ENTEG and at the Bernoulli Institute for Mathematics, Computer Science and Artificial Intelligence. At the national level, systems and control research activities are part of the Dutch Institute of Systems and Control (DISC). For this tenure track position, a role in the National Network on the Mathematics for Operations Research (LNMB) or other relevant national networks is considered to be valuable. In addition, research collaboration with the Operations group of the Faculty of Economics and Business with the University of Groningen is foreseen.

## **7. Expected contributions to education**

The candidate will contribute 30% of their time to teach mainly in the bachelor and master programmes Industrial Engineering and Management, and to a lesser extent in the master programmes Mechanical Engineering, and Systems and Control. Next to teaching courses, they are expected to play an active role in the development of these educational programmes and specifically in complementing the disciplines currently offered with additional courses on strategic decision-making and game theory for dynamical systems. Furthermore, the candidate will be involved in supervising bachelor and master students in research projects.

## **8. Expected contributions to research**

Within the broad areas of Operations Research, and Systems and Control, and Optimization and Game Theory, the successful candidate is expected to set-up their research line of high quality. The research should compete on a worldwide level and lead to publications in top journals. Obtaining substantial external funding is crucial. Supervision of PhD students is an important part of the research activities. The research is expected to cross-fertilize the existing research within the institute and should lead to a strengthening of the international reputation of the group and the institute.

## **9. Expected contributions to the organization**

The candidate is expected to have an active interest and to provide a positive contribution to the management and organizational tasks of the institute. The candidate will furthermore contribute to the organization of the faculty, for example by participating in working groups and committees, in the domains of education, research and management. The candidate will contribute to relevant organizational activities on the national and international level.

