# TENSOR-BASED
# SIGNAL PROCESSING

EURASIP
SUMMER
SCHOOL
2018

# Program

## Monday, August 27

| | |
|---|---|
| 08h15 - 08h45 | **Registration** |
| 08h45 - 10h45 | Lecture:<br>Introduction<br>Tucker decomposition<br>Multilinear Principal Component Analysis |
| 10h45 - 11h15 | **Coffee break** |
| 11h15 - 12h45 | Exercise session |
| 12h45 - 14h15 | **Lunch break** |
| 14h15 - 16h15 | Lecture:<br>Canonical Polyadic Decomposition<br>Tensor-based signal enhancement |
| 16h15 - 16h45 | **Coffee break** |
| 16h45 - 19h15 | Exercise session |
| 21h00 | Social event: Pub crawl with locals |

The meeting point for the social event is at the *Leuven City Hall* in the city center (see map). All other sessions take place at *Room 91.200 at ESAT*.

## Tuesday, August 28

08h45 - 10h45    Lecture:
Statistical approaches to blind signal separation
Deterministic approaches to blind signal separation

10h45 - 11h15    **Coffee break**

11h15 - 12h45    Exercise session

12h45 - 14h15    **Lunch break**

14h15 - 16h15    Lecture:
Constrained decompositions
Coupled matrix/tensor decompositions and applications in data fission and fusion

16h15 - 16h45    **Coffee break**

16h45 - 19h15    Exercise session

20h30    Social event: Health House visit

The meeting point for the social event is at 20h00 in front of *ESAT's main entrance* (see map). All other sessions take place at *Room 91.200 at ESAT*.

# Wednesday, August 29

| | | |
|---|---|---|
| 08h15 - 08h45 | **Registration** | |
| 08h45 - 10h45 | *Invited lecture: Michael Ng*<br>Tensor data completion and its applications<br>Chair: Lieven De Lathauwer | p. 22 |
| 10h45 - 11h15 | **Coffee break** | |
| 11h15 - 12h00 | *Nico Vervliet*<br>Numerical optimization-based tensor algorithms<br>Chair: Michael Ng | p. 24 |
| 12h00 - 12h45 | *Michiel Vandecappelle*<br>Updating tensor decompositions<br>Chair: Michael Ng | p. 26 |
| 12h45 - 14h15 | **Lunch break** | |
| 14h15 - 16h15 | *Invited lecture: Ming Yuan*<br>Statistical analysis of large tensors<br>Chair: Lieven De Lathauwer | p. 28 |
| 16h15 - 16h45 | **Coffee break at *Cafeteria*** | |
| 16h45 - 19h00 | Poster session at *Cafeteria* | |
| 19h00 - 20h30 | Networking Reception at *Arenberg castle* | |

The second coffee break and subsequent poster session take place at the *Cafeteria at ESAT*. The Networking reception takes place at the saloons of the *Arenberg castle*. All other sessions take place at *Auditorium C at ESAT*.

# Thursday, August 30

| | | |
|---|---|---|
| 08h45 - 10h45 | *Invited lecture: Orly Alter*<br>Multi-tensor decompositions for personalized cancer diagnostics and prognostics<br>Chair: Sabine Van Huffel | p. 30 |
| 10h45 - 11h15 | **Coffee break** | |
| 11h15 - 12h45 | *Sabine Van Huffel*<br>Biomedical data fusion using tensor-based blind source separation<br>Chair: Orly Alter | p. 34 |
| 12h45 - 14h15 | **Lunch break** | |
| 14h15 - 15h15 | *Invited lecture: Nicolas Gillis*<br>Dictionary-based decompositions<br>Chair: Ming Yuan | p. 36 |
| 15h15 - 16h15 | *Invited lecture: Ivan Markovsky*<br>Structured low-rank approximation with applications<br>Chair: Ming Yuan | p. 38 |
| 16h15 - 16h45 | **Coffee break** | |
| 16h45 - 18h15 | *Borbála Hunyadi*<br>Tensor-based blind source separation in simultaneous EEG-fMRI integration (lecture and demo)<br>Chair: Petr Tichavsky | p. 40 |

19h30            Banquet at the *Faculty club restaurant*

The banquet takes places at the *Faculty club restaurant* (see map) in the Leuven Great Beguinage (UNESCO world heritage site). All other sessions take place at *Auditorium C at ESAT*.
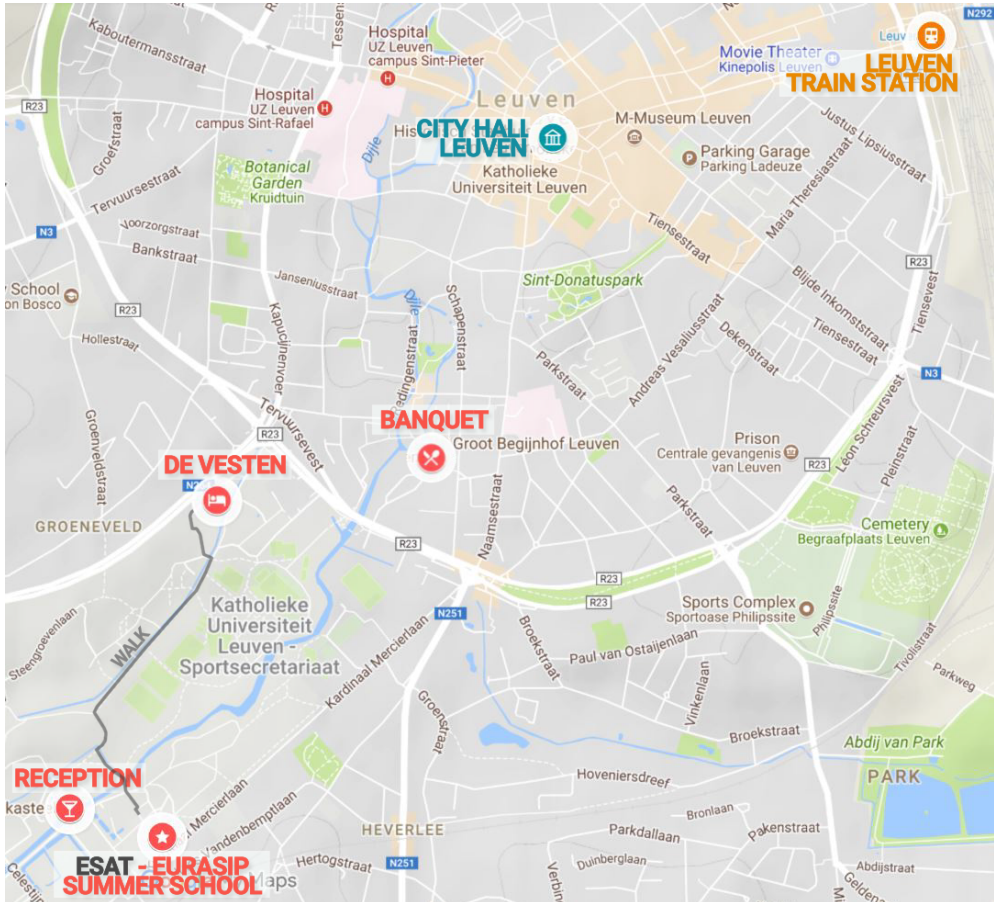
## Friday, August 31

08h45 - 09h45     *Invited lecture: Ahmad Mouri Sardarabadi*     p. 42
Covariance matching for radio astronomy
Chair: Nicolas Gillis

09h45 - 10h45     *Bharath Halandur Nagaraja and Sabine Van Huffel*     p. 44
Tensor-based blind source separation in Magnetic
Resonance Spectroscopic Imaging (lecture; demo
after break)
Chair: Nicolas Gillis

10h45 - 11h15     **Coffee break**

11h15 - 12h45     *Griet Goovaerts*     p. 48
Tensor-based blind source separation in cardiac
monitoring (lecture and demo)
Chair: Ahmad Mouri Sardarabadi

12h45 - 14h15     **Lunch break**

14h15 - 15h00     *Martijn Boussé*     p. 50
Linear systems with a CPD constrained solution
Chair: Sabine Van Huffel

15h00 - 16h15     *Lieven De Lathauwer*     p. 52
The curse and blessing of dimensionality
Chair: Sabine Van Huffel

All sessions take place at *Auditorium C at ESAT*.

# City map with conference locations



From bottom to top: ESAT KU Leuven, *Kasteelpark Arenberg 10* (**Summer school venue**). Arenberg castle (**Reception**). De Vesten, *Tervuursevest 107* (**Lodging**). Restaurant Faculty Club, *Groot Begijnhof 14* (**Banquet**). City Hall Leuven (Start social activity on Monday). Finally, the Leuven train station for reference purposes
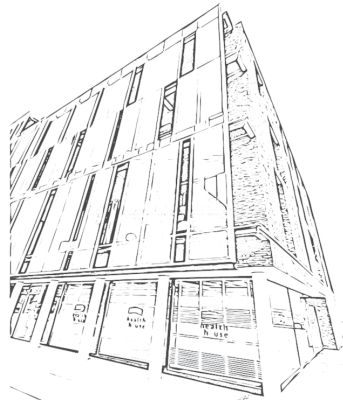
# Social Events

## Pub crawl with locals starting from *City Hall*

*Monday, August 27 - 21h00*

**Where:** Grote Markt 9, 3000 Leuven

**What:** Get to know your fellow researchers, grab a drink and enjoy the historic center of Leuven and local bars.

## Health House visit

*Tuesday, August 28 - 20h30*

**Where:** Arenberg Science Park, Gaston Geenslaan 11, 3001 Heverlee

**What:** Health House opens up new horizons in health technology by uniting health, high-tech and all the people around it. Providing hands-on interaction with cutting-edge technology and inspiration for research, business, and cooperations.

**Remark:** Registration is required as places are limited. To do so, just contact a member of the organizers during a coffee break.

**Networking Reception at *Arenberg castle***

*Wednesday, August 29 - 19h00-20h30*

**Where:** We meet in front of ESAT's main entrance and walk together to Kasteelpark Arenberg 1, 3001 Heverlee

**What:** Enjoy a networking reception at the Arenberg castle, the heart of the campus for the Science and Technology group at the KU Leuven.



**Banquet at the *Faculty club restaurant***

*Thursday, August 30 - 19h30*

**Where:** Groot Begijnhof 14, 3000 Leuven

**What:** Enjoy a dinner at the faculty club restaurant, situated within Leuven's historic Great Beguinage, a UNESCO world heritage site.