Customers interact with an organization and its products and services in various ways: online shopping, after-sales, added services, social media, complaints, actual product usage (internet of things), upgrades, etc. Linking the various touch-points between these forms of interaction is vital for understanding and improving the overall customer journey.

We analyze this challenging multidisciplinary problem from several complementary research perspectives: predictive analytics, process mining, human computer interaction, user psychology, marketing and innovation.
Scope

Customers interact with an organization and its products and services in various ways: online shopping, after-sales, added services, social media, complaints, actual product usage (internet of things), upgrades, etc. To **understand and to improve the overall customer journey**, it is vital to link the various touch-points. This is an extremely challenging multidisciplinary problem that we analyze from several complementary research perspectives: **predictive analytics**, **data mining**, **process mining**, **human computer interaction**, **user psychology**, **marketing**, and **innovation**.

During the interaction with an organization, customers leave many traces of their behavior. The interpretation of these traces and the extraction of actionable knowledge requires expertise on data collection and statistical techniques. Actionable knowledge is linked to understanding customers in the way that they behave, collect information and decide. A vast amount of data makes this possible. Data analytics ought to be employed to understand the user population, the organization’s outputs and the interaction between them. It is time to find streams of knowledge in a sea of data!

Vision

To understand and improve the customer journey through informed and responsible analytics.

Research challenges

* a) **Gaining actionable and trustable insights**
   By using the data and user theories, actionable and trustable insights should be gained. The output is to be provided in the form of user-interpretable and trustworthy models.

* b) **Modeling evolving customer behavior, and customer behavior under (co-)evolving circumstances**
   Customer behavior changes. It is important to recognize such changes, and to understand how behavior changes under evolving circumstances.

* c) **Enriching data mining**
   Consumer psychology and marketing insights should enrich the data mining and process mining approaches.

* d) **Understanding when and why segments of customers deviate from the common path**
   Recognizing that groups of customers behave differently, for instance through process mining and exceptional model mining.

* e) **Analyzing life-long customer journeys**
   Customer journeys are not always local and short, but often part of a longer journey. This requires a different analysis approach to cope with the longer time-scale.

* f) **Creating real-time predictive and prescriptive models**
   Real-time predictive models are necessary to quickly react to actions when managing sales processes and customer experience processes. Prescriptive models are necessary to guide the standard process.

* g) **User-centric evaluation of the customer journey**
   Triangulation of behavioural and user experience data to understand why and how interventions work (or not).
Informed and responsible analytics
to understand and improve the customer journey

Project examples

**NWO RATE-Analytics** *Rabobank, Achmea, TiU/JADS*
We develop foundations and techniques for next generation big data analytics, combining predictive analytics, modern statistics, and visual analytics. This unique combination will lead to breakthroughs in data-driven banking and insurance, facilitating the development of more reliable, transparent, and responsible analytics solutions and products.

**MiCuB** *BrandLoyalty*
Real-time mining of customer behavior to increase the effectiveness of loyalty programs and predict bottlenecks. The evolution of customer behavior models over time is mined together with the streams of resources during the promotion period.

**Supporting energy saving decisions** *NWO-PhD*
Helping users save energy by supporting them through personalized saving recommendations using their implementation likelihood and energy saving ability.

**Sales process engineering at Philips Lighting**
Analyzing customer journeys using process mining techniques to propose improvements based on bottleneck detection and a comparison of the actual execution with the formal process. The most valuable activities per attribute are also analyzed.

**KYC-Analytics** *Rabobank*
Applying deep learning, NLP, and pattern mining.

Scientific staff involved

**Core team**
- **Prof. Mykola Pechenizkiy** *(RP leader)*
  - Predictive analytics
- **Dr. Michel van der Borgh**
  - Data-driven sales process engineering
- **Dr. Wouter Duivesteijn**
  - Data mining
- **Dr. Marwan Hassani**
  - Customer journey real-time process mining
- **Prof. Chris Snijders**
  - Human-data interaction
- **Dr. Martijn Willemsen**
  - User psychology / user-centric evaluation
- **Ir. Joost Gabriels / Drs. Masja Kempen**
  - Project Development Officers

**Selection of other staff involved**
- **Dr. Sarah Gelper**
  - Quantitative marketing research
- **Prof. Uzay Kaymak**
  - Business intelligence
- **Prof. Fred Langerak**
  - Product development & management
- **Prof. Massimiliano de Leoni**
  - Customer journey process mining
- **Dr. Vlado Menkovski**
  - Deep learning
- **Dr. Nevin Mutlu**
  - Retail operations
- **Prof. Dr. Ed Nijssen**
  - Technology marketing
- **Prof. Bettina Speckmann**
  - Geo-spatial algorithms and visualization
- **Prof. Jack van Wijk**
  - Visual analytics

**External cooperation**

**Philips** *Data Science for health flagship (DDVP Stream)*
Process mining, model adaptation, coaching models, recommenders, user experience

**Adversitement and StudyPortals** *STW CAPA*
Context-awareness and concept drift handling

**Interpolis**
Developing prevention recommendations for clients using a smart combination of recommender systems algorithms and user psychology

We also collaborate with Tilburg University in the Jheronimus Academy of Data Science (JADS).
DSC/e research programs

The DSC/e consists of over thirty research groups, each of which is working on their own topic and/or technique, across six involved departments. This wide distribution of research efforts creates many opportunities for new collaborations. By setting up research programs the DSC/e aims to connect these efforts to initiate and align joint research. The research programs are centered around key topics where there is a strong researcher base, with a high impact in research and society.

The program provides a meeting place for researchers and industry to get together and have discussions, workshops or research meetings. The goal is to let novel ideas emerge and collaborations between researchers and external parties to be started or strengthened. It is also important for researchers to be aware of the current industrial challenges, and for industry to be aware of the state of the art of research. Existing external contacts can easily be shared to further increase external collaboration.

Running research programs

Customer Journey - Prof Mykola Pechenizkiy
*Informed and responsible analytics to understand and improve the customer journey*

Health Analytics - Prof Uzay Kaymak
*Improving your health through data analytics*

Internet of Things - Prof Antonio Liotta
*Computational intelligence and network science for the Internet of Things*

Quantified Self - Prof Aarnout Brombacher
*Human Vitality & Technology*

Smart Manufacturing and Maintenance - Prof Geert-Jan van Houtum
*Exploit the full potential of your data to boost manufacturing and maintenance!*

More information regarding the research programs can be found on our website: [www.tue.nl/dsce/rp](http://www.tue.nl/dsce/rp)

You can also contact us directly at [dsce@tue.nl](mailto:dsce@tue.nl)