




Gergő Pintér

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Nationality: Hungarian


Gender: Male


CONTACT

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ABOUT ME

engineering information technologist, Ph.D. | data scientist

WORK EXPERIENCE

06/2022 – CURRENT – Budapest, Hungary

Research Fellow

Corvinus University of Budapest

01/02/2016 – 31/03/2022 – Budapest, Hungary

University research assistant

Óbuda University

The topic of my research is characterizing the mobility customs of the urban population using mobile phone network data. For the featured publications, see the Publications section.

Teaching experience: a facultative subject about modern software developing methodologies (eg., SCRUM, Kanban, Continuous Integration)

01/10/2015 – 30/09/2016 – Budapest, Hungary

Software developer

Institute for Computer Science and Control, Hungarian Academy of Sciences (MTA SZTAKI)

Working on the Java based backend of the Hungarian scientific publication database (MTMT2)

Department of Distributed Systems / <https://www.sztaki.hu/en/science/departments/dsd> / Kende utca 13-17., 1111, Budapest, Hungary

30/06/2014 – 25/07/2014 – Budapest, Hungary

Software developer (professional practice)

Institute for Computer Science and Control, Hungarian Academy of Sciences (MTA SZTAKI)

My task was to install the latest OpenStack cloud computing software and examine its identification subsystem in order to extend it with SAML based authentication and authorization method.

Department of Network Security and Internet Technologies / <https://www.sztaki.hu/en/science/departments/hbit> / Kende utca 13-17., 1111, Budapest, Hungary

02/2013 – 12/2013 – Budapest, Hungary

Software developer

John von Neumann Faculty of Informatics, Óbuda University

Projects I was involved:

- Classification of tissues for cancer diagnostic via high quality images (machine learning)
- Developing Augmented Reality platforms (backend architecture and rule based evaluation system)
- Patient journey analysis for dental treatment

EDUCATION AND TRAINING

02/2016 – 07/07/2022 – Bécsi út 96/B, Budapest, Hungary

PhD in Applied Informatics

Óbuda University

The topic of my research is characterizing the mobility customs of the urban population using mobile phone network data. I used Call Detail Records from one of the Hungarian mobile operators to analyze the mobility customs (e.g., commuting) of the population of Budapest and its agglomeration. I developed a model to estimate the socioeconomic status of the subscribers based on their mobility patterns. The dissertation is still not defended.

Teaching experience: facultative subject about modern software developing methodologies (eg., SCRUM, Kanban, Continuous Integration)

Field(s) of study

- Information and Communication Technologies

Analyzing the Mobility Customs of the Urban Population Using Mobile Network Data (still undefended)

| EQF level 8 | <https://uni-obuda.hu/en>

09/2013 – 06/2015 – Bécsi út 96/B, Budapest, Hungary

Engineering Information Technologist (MSc)

John von Neumann Faculty of Informatics, Óbuda University

- Specialization: Integrated Intelligent Systems
- Thesis work: Fault tolerance in distributed stream processing systems
- in which I improved the fault tolerance module of Apache Flink data processing framework to be able to guarantee the exactly-once processing

Field(s) of study

- Information and Communication Technologies

EQF level 7 | <http://nik.uni-obuda.hu/en>

09/2009 – 02/2013 – Bécsi út 96/B, Budapest, Hungary

Engineering Information Technologist (BSc)

John von Neumann Faculty of Informatics, Óbuda University

- Specialisation: Computer System Engineer
- Thesis work: Support for nature inspired coordination models
- in which I developed an experiment environment for working with resource scheduling problems in a heterogeneous distributed computational grid with the chemistry-inspired computational model and the Higher-Order Chemical Language based on it. I also created a reference scheduler in HOCL.

Field(s) of study

- Information and Communication Technologies

Support for Nature Inspired Coordination Models | EQF level 6 | <http://nik.uni-obuda.hu/en>

LANGUAGE SKILLS

MOTHER TONGUE(S): Hungarian

OTHER LANGUAGE(S):

English

Listening
B2

Reading
C1

**Spoken
production**
B2

**Spoken
interaction**
B2

Writing
C1

Swedish

Listening
B1

Reading
B1

**Spoken
production**
B1

**Spoken
interaction**
B1

Writing
B1

DIGITAL SKILLS

My Digital Skills

Data Science, Data Analytics, Data Visualization / Intermediate user of Python including scientific modules (NumPy, SciPy, Matplotlib, Pandas) / LaTeX / CI / DevOps / Python / Git / Linux

PUBLICATIONS

Awakening City: Traces of the Circadian Rhythm within the Mobile Phone Network Data

2022 <https://doi.org/10.3390/info13030114>

Gergő Pintér, Imre Felde

In this study, call detail records (CDR), covering Budapest, Hungary, are processed to analyze the circadian rhythm of the subscribers. An indicator, called wake-up time, is introduced to describe the behavior of a group of subscribers. It is defined as the time when the mobile phone activity of a group rises in the morning. Its counterpart is the time when the activity falls in the evening. Inhabitant and area-based aggregation are also presented. The former is to consider the people who live in an area, while the latter uses the transit activity in an area to describe the behavior of a part of the city. The opening hours of the malls and the nightlife of the party district are used to demonstrate this application as real-life examples. The proposed approach is also used to estimate the working hours of the workplaces. The findings are in a good agreement with the practice in Hungary, and also support the workplace detection method. A negative correlation is found between the wake-up time and mobility indicators (entropy, radius of gyration): on workdays, people wake up earlier and travel more, while on holidays, it is quite the contrary. The wake-up time is evaluated in different socioeconomic classes, using housing prices and mobile phones prices, as well. It is found that lower socioeconomic groups tend to wake up earlier.

Analyzing the Behavior and Financial Status of Soccer Fans from a Mobile Phone Network Perspective: Euro 2016, a Case Study

2021 <https://doi.org/10.3390/info12110468>

Gergő Pintér, Imre Felde

In this study, Call Detail Records (CDRs) covering Budapest for the month of June in 2016 were analyzed. During this observation period, the 2016 UEFA European Football Championship took place, which significantly affected the habit of the residents despite the fact that not a single match was played in the city. We evaluated the fans' behavior in Budapest during and after the Hungarian matches and found that the mobile phone network activity reflected the football fans' behavior, demonstrating the potential of the use of mobile phone network data in a social sensing system. The Call Detail Records were enriched with mobile phone properties and used to analyze the subscribers' devices. Applying the device information (Type Allocation Code) obtained from the activity records, the Subscriber Identity Modules (SIM), which do not operate in cell phones, were omitted from mobility analyses, allowing us to focus on the behavior of people. Mobile phone price was proposed and evaluated as a socioeconomic indicator and the correlation between the phone price and the mobility customs was found. We also found that, besides the cell phone price, the subscriber age and subscription type also had effects on users' mobility. On the other hand, these factors did not seem to affect their interest in football.

Evaluating the Effect of the Financial Status to the Mobility Customs

2021 <https://doi.org/10.3390/ijgi10050328>

Gergő Pintér, Imre Felde

In this article, we explore the relationship between cellular phone data and housing prices in Budapest, Hungary. We determine mobility indicators from one month of Call Detail Records (CDR) data, while the property price data are used to characterize the socioeconomic status at the Capital of Hungary. First, we validated the proposed methodology by comparing the Home and Work locations estimation and the commuting patterns derived from the cellular network dataset with reports of the national mini census. We investigated the statistical relationships between mobile phone indicators, such as Radius of Gyration, the distance between Home and Work locations or the Entropy of visited cells, and measures of economic status based on housing prices. Our findings show that the mobility correlates significantly with the socioeconomic status. We performed Principal Component Analysis (PCA) on combined vectors of mobility indicators in order to characterize the dependence of mobility habits on socioeconomic status. The results of the PCA investigation showed remarkable correlation of housing prices and mobility customs.

Artificial Intelligence for Modeling Real Estate Price Using Call Detail Records and Hybrid Machine Learning Approach

2020 <https://doi.org/10.3390/e22121421>

Gergő Pinter, Amir Mosavi, Imre Felde

Advancement of accurate models for predicting real estate price is of utmost importance for urban development and several critical economic functions. Due to the significant uncertainties and dynamic variables, modeling real estate has been studied as complex systems. In this study, a novel machine learning method is proposed to tackle real estate modeling complexity. Call detail records (CDR) provides excellent opportunities for in-depth investigation of the mobility characterization. This study explores the CDR potential for predicting the real estate price with the aid of artificial intelligence (AI). Several essential mobility entropy factors, including dweller entropy, dweller gyration, workers' entropy, worker gyration, dwellers' work distance, and workers' home distance, are used as input variables. The prediction model is developed using the machine learning method of multi-layered perceptron (MLP) trained with the evolutionary algorithm of particle swarm optimization (PSO). Model performance is evaluated using mean square error (MSE), sustainability index (SI), and Willmott's index (WI). The proposed model showed promising results revealing that the workers' entropy and the dwellers' work distances directly influence the real estate price. However, the dweller gyration, dweller entropy, workers' gyration, and the workers' home had a minimum effect on the price. Furthermore, it is shown that the flow of activities and entropy of mobility are often associated with the regions with lower real estate prices.

Activity Pattern Analysis of the Mobile Phone Network During a Large Social Event

2019 <https://doi.org/10.1109/rivf.2019.8713741>

Gergő Pintér, László Nádai, Gábor Bognár, Zoltán Biczó, Imre Felde

By carrying mobile phones, people leaves digital footprints in the mobile phone network that provides rich information about the transportation customs. To understand the behavior of urban environments this data, provided by a Hungarian mobile network operator, is analyzed. The behavior of the city parts has been analyzed using the number of mobile phone activities including calls, texting and data transfer. The proposed approach is to identify regions of a city with similar behavior in mobile phone activity. This paper demonstrates the introduced method using a public demonstration event as a case study. It is clear from the data that the demonstrators caused an increase in the mobile phone network load at the places of the demonstration, so it was possible to identify their path.

Analysis of Mobility Patterns During a Large Social Event

2018 <https://doi.org/10.1109/sisy.2018.8524674>

Gergő Pintér, László Nádai, Imre Felde

The cellular networks including the millions of mobile devices generate a huge volume (mobile phone call records) of data by which the movements of people could be sensed. In this paper, a method (based on mobile phone call records) applied to characterize the patterns of urban population during a big social event is underlined. The proposed method is also to show the regions in the city where the similar trend of mobility takes place. This paper demonstrates the applicability of the approach on the data provided by a Hungarian mobile network operator during a public demonstration event. The results obtained can be helpful in understanding the structure of the city in the sense of human mobility related to large-scale events.

Evaluation of Mobile Phone Signals in Urban Environment During a Large Social Event

2018 <https://doi.org/10.1109/saci.2018.8440943>

Gergő Pintér, László Nádai, Gábor Bognár, Imre Felde

The information about people's mobility patterns, during large social events, in a city, could play an important role in understanding the behavior of urban environments. This study is based on the characterization of records of mobile devices performed around the time and place of a large social event, in Hungary. Human mobility has been analysed in terms of the number of mobile phone activities including calls, texting and data transfer. We use heat maps to visualize the temporo-spatial dynamics of the movement patterns within the crowd. The results obtained can be helpful in improving the understanding of human mobility related to large-scale events.