

Mesterséges intelligencia az orvosbiológiában

Artificial intelligence in biomedicine

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Computational Biomedicine (ComBine) Workgroup

Intelligent Systems Group

Faculty of Electrical Engineering and Informatics (VIK)

Department of Measurement and Information Systems

Budapest University of Technology and Economics (BME)

Ágenda

- A „Computational biomedicine” labor bemutatása
 - Mesterséges intelligencia
 - Statisztika és gépi tanulás
 - Genetika
 - Gyógyszerkutatás
- Javasolt témák
 - Viselhető elektronikai eszközök
 - Orvosi képfeldolgozás
 - Genetikai adatfeldolgozás
 - Orvosbiológiai hálózatok
 - Adatelemzés
 - Klinikai döntéstámogatás
 - Természetes nyelvű szövegfeldolgozás
 - Gyógyszerkutatás
- Kapcsolódó kurzusok
 - Egészségügyi informatika és biostatisztika VIMIM206
 - Bioinformatika VIMIIV10
 - Mesterséges általános intelligencia VIMIIV22

Computational Biomedicine COMBINE lab



News About us Team Research Publications Courses Tools Materials

Downloads

BayesCube for Windows 32-bit
BayesCube for Windows 64-bit
BayesCube for Linux 32-bit
BayesCube for Linux 64-bit
BayesCube for MacOSX 64-bit

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Visual data analytics in pharmaceutical informatics

Date: 11/01/2017

In cooperation with CERN and MTA-Wigner we will investigate the use of large-scale, semantic visual data analytics in drug discovery.



Privacy preserving fusion in CELSA

Date: 10/01/2017

Our new project "HIDUCTION: Privacy preserving data sharing, analysis and decision support in personalized medicine" will start this year in cooperation with ESAT-STADIUS, K.U.Leuven (2017-2019).



Continued participation in the "UK Biobank"

Date: 09/13/2017

The "UK Biobank project No.1602" is extended till 2020. In cooperation with the University of Manchester and Semmelweis University, we investigate the interactions between diet, psychosocial and genetic factors for self-reported depression and related disorders



We joined the NVIDIA GPU GRANT program

Date: 09/06/2017

We joined the NVIDIA GPU GRANT program of Nvidia Corporation. We will explore bioinformatic and chemoinformatic applications of the donated GPUs.



New Bayesian OTKA project

Team

Bence Bolgár
Bence Bruncsics
András Gézi
Gábor Hullám
András Millinghoffer
Péter Sárközy

Péter Antal

<http://bioinfo.mit.bme.hu/>

Viselhető elektronikai eszközök

- Goal: Maintaining or improving quality of life
- Target group
 - People with physical or mental sicknesses
 - People with disabilities
 - Aged people
 - Home fitness
- Target group is growing...

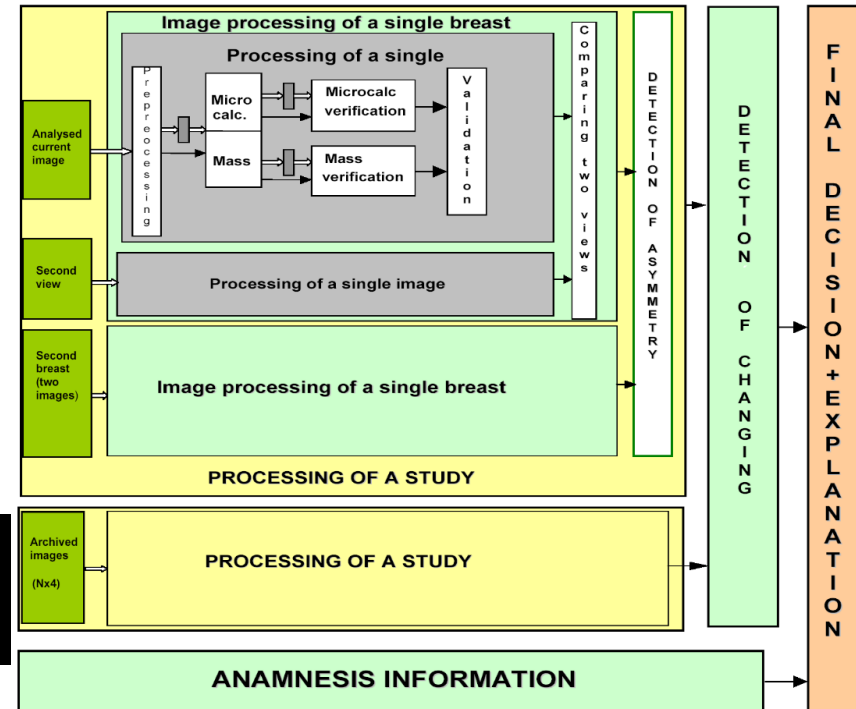
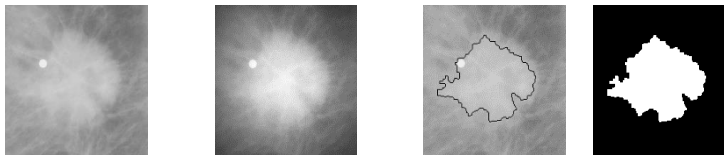


Pataki B, Hanák P, Csukly G, Surpassing Entertainment with Computer Games: Online Tools for Early Warnings of Mild Cognitive Impairment, In: Information and Communication Technologies for Ageing Well and e-Health: First International Conference, ICT4A ageingWell 2015. , Lisbon, Portugal, May. 2015. Heidelberg; New York: Springer, 2015. pp. 217-237.

Györke P, Pataki B, Energy Harvesting Wireless Sensors for Smart Home Applications
In: 2015 IEEE International Instrumentation and Measurement Technology Conference, I2MTC 2015. Pisa, Italy, May 2015., pp. 1757-1762.

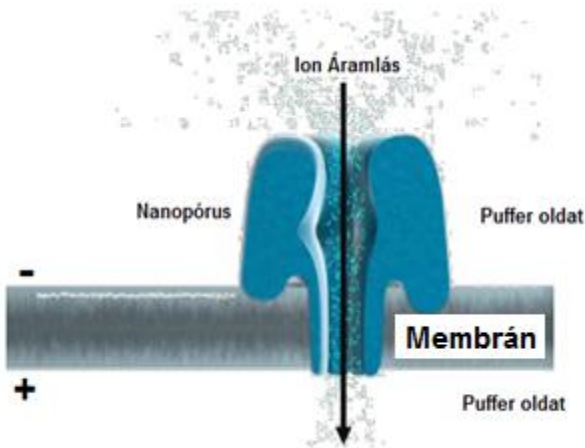
Orvosi képfeldolgozás

- Hard task even for an expert
- Heterogeneous information
- Exact model is not available

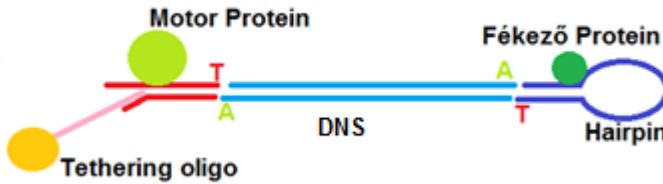


Horváth, Gábor, et al. "Intelligent advisory system for screening mammography." *Instrumentation and Measurement Technology Conference, Proceedings of the 21st IEEE*. Vol. 3., 2004

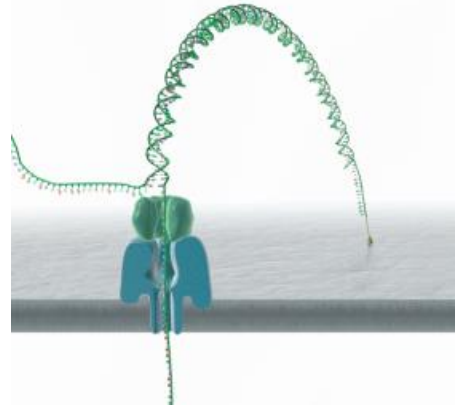
Nanopore MinION



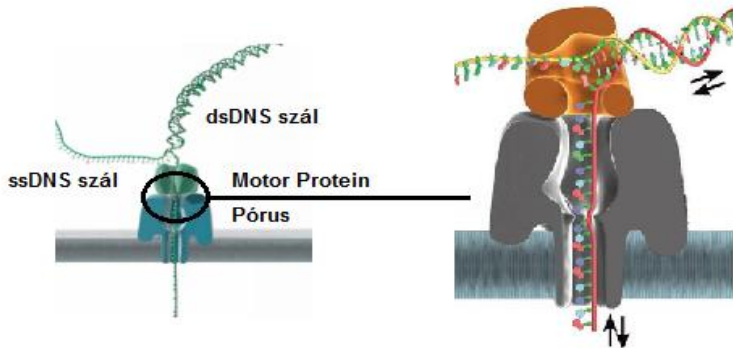
Protein Nanoporus



Szekvenálásra Előkészített DNS szál



Tethering



A DNS szál leolvasása

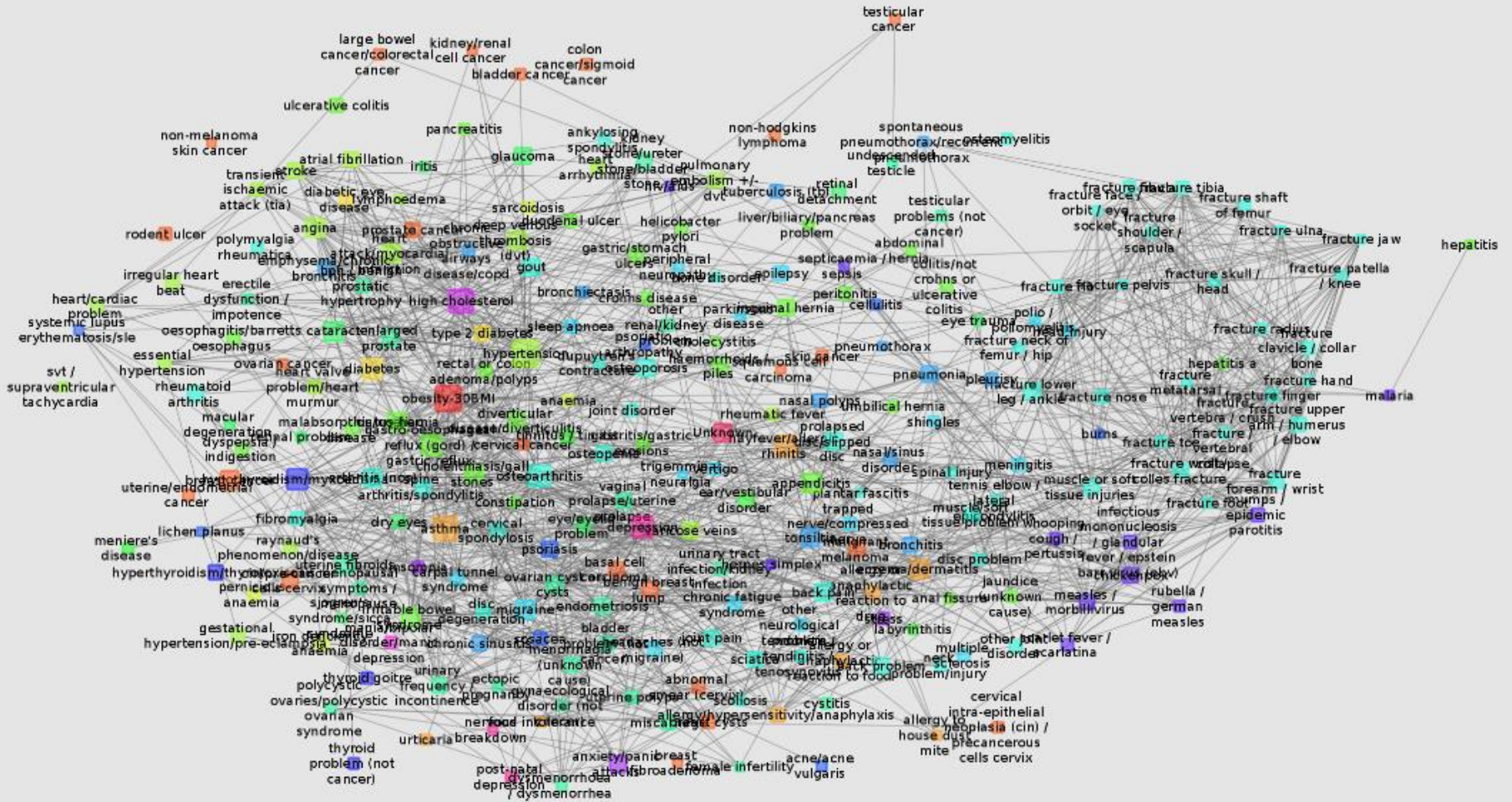


Szekvencia

Gézi, A., Bolgár, B., Marx, P., Sarkozy, P., Szalai, C., & Antal, P. (2015).

VariantMetaCaller: automated fusion of variant calling pipelines for quantitative, precision-based filtering. *BMC genomics*, 16(1), 875.

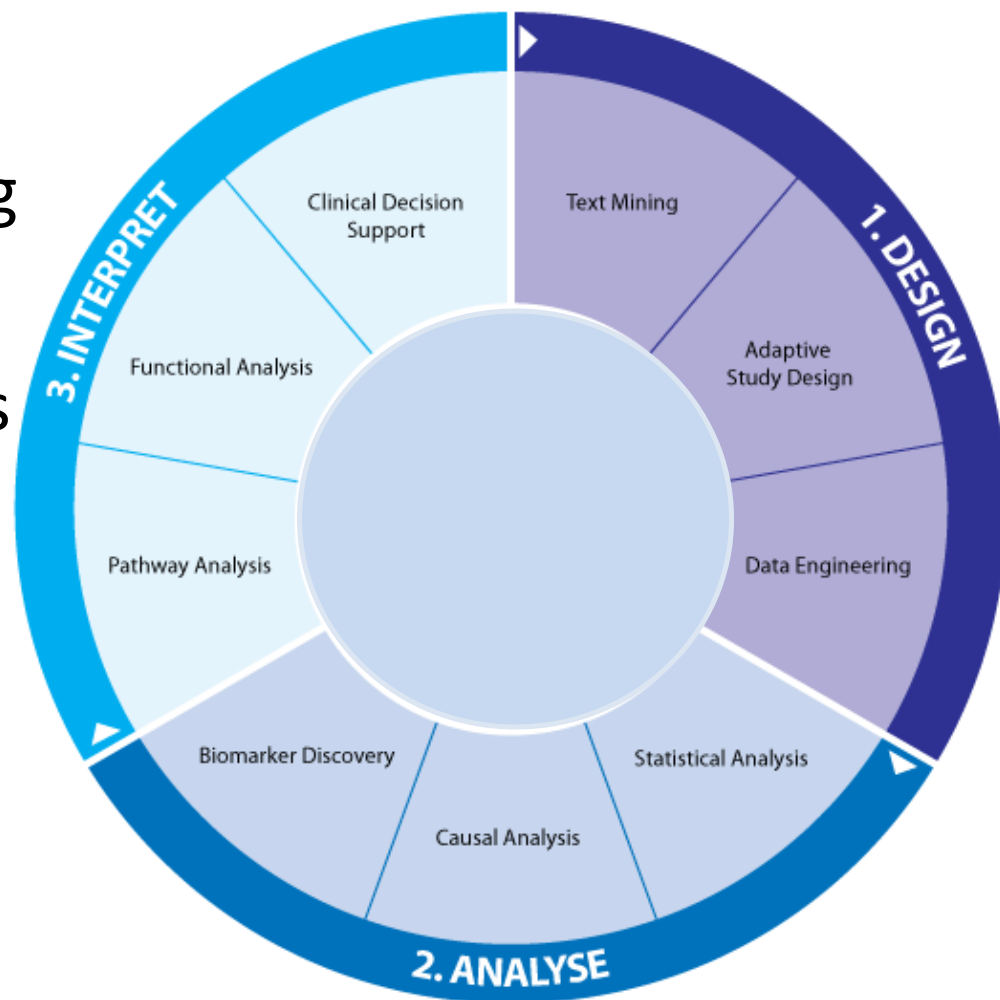
Orvosbiológiai hálózatok



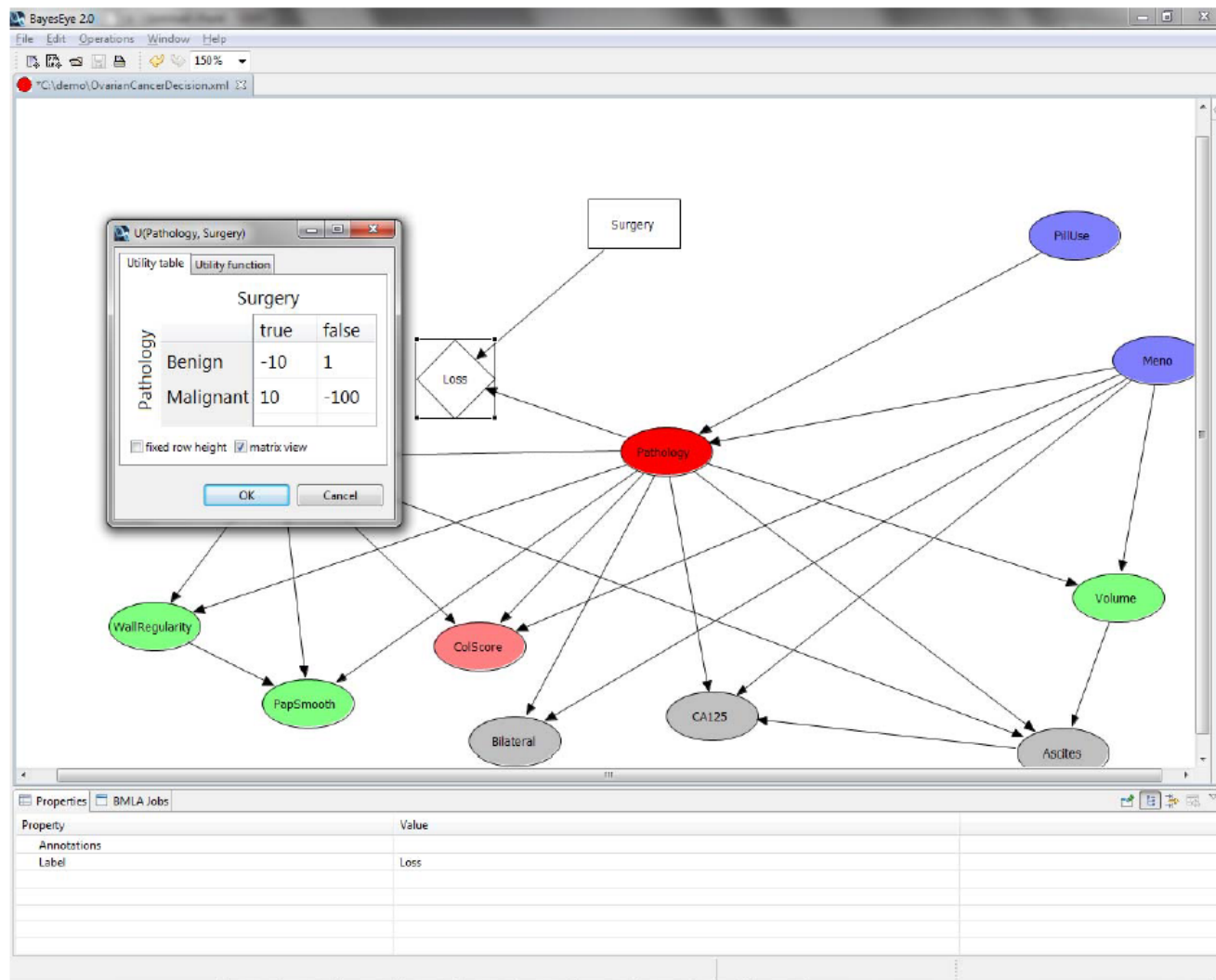
Marx, P., Antal, P., Bolgar, B., Bagdy, G., Deakin, B., & Juhasz, G. (2017). Comorbidities in the diseasome are more apparent than real: What Bayesian filtering reveals about the comorbidities of depression. *PLoS computational biology*, 13(6), e1005487.

Statisztikai adatelemzés

- Knowledge engineering
- Study design
- Genetic measurements
- Data engineering
- Data analysis
- Interpretation
- Decision support

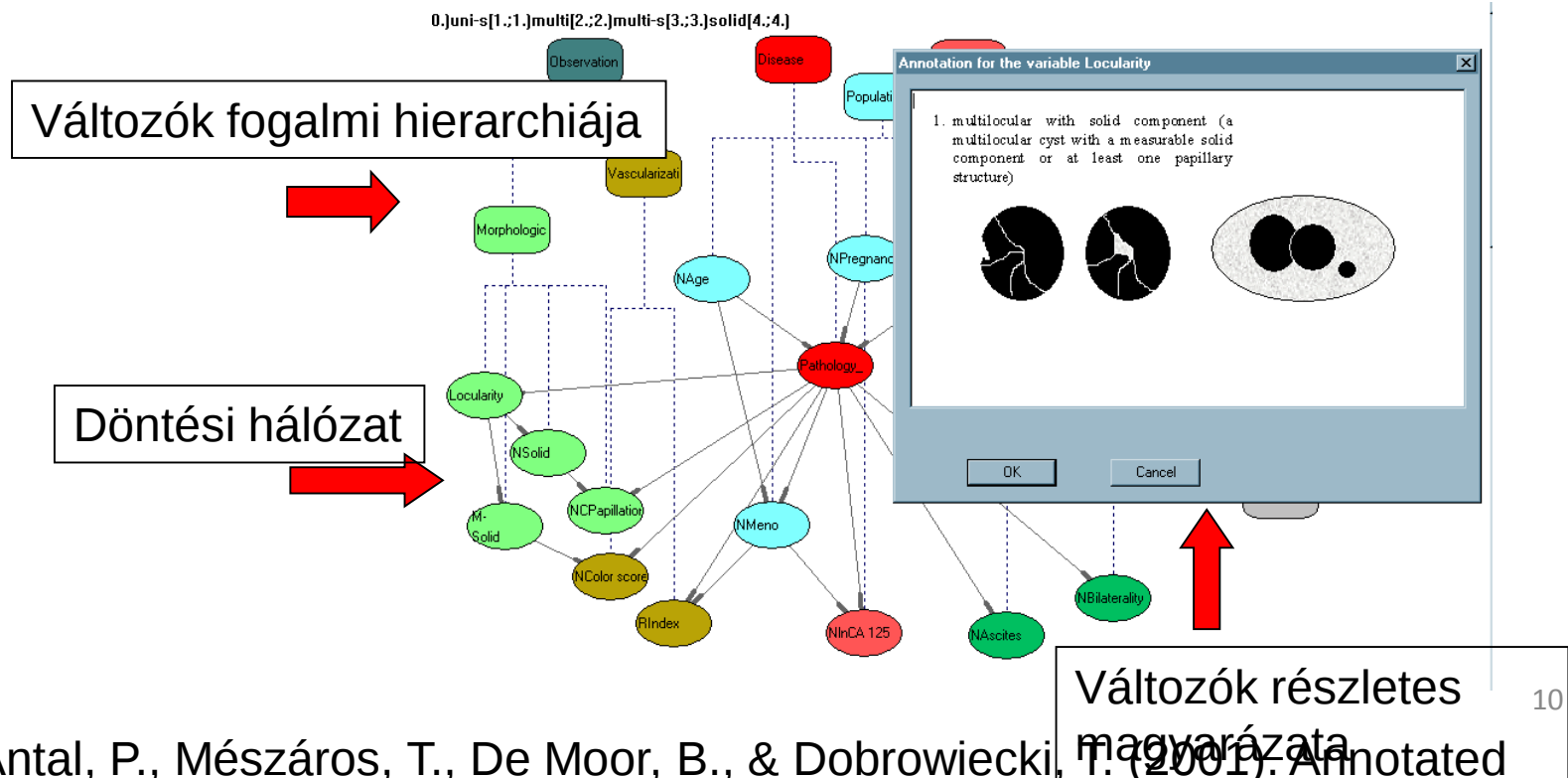


Klinikai döntéstámogatás



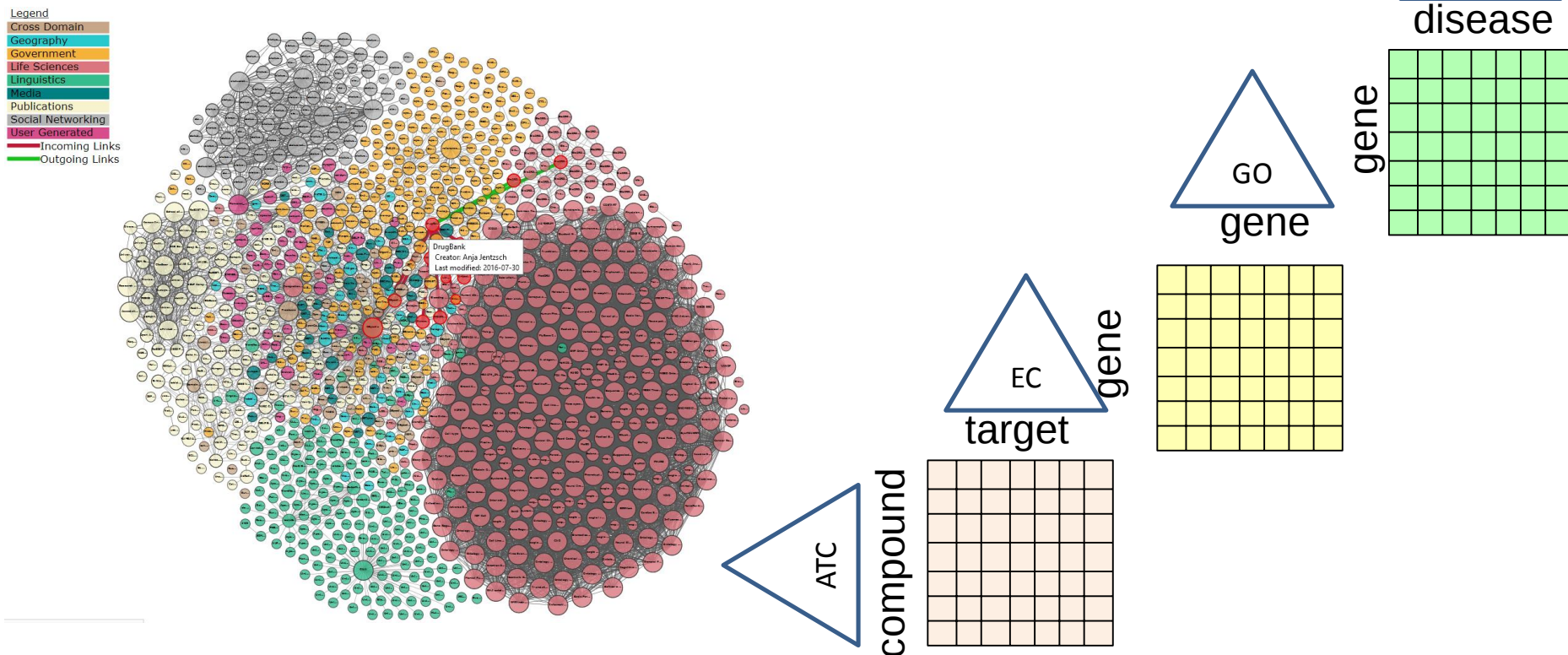
Antal, P., Fannes, G., Timmerman, D., Moreau, Y. and De Moor, B., 2004. Using literature and data to learn Bayesian networks as clinical models of ovarian tumors. *Artificial Intelligence in medicine*, 30(3), pp.257-281.

Szövegbányászat, magyarázatgenerálás



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Gyógyszerkutatás



Ádám Arany, Bence Bolgár, Balázs Balogh, Peter Antal, Péter Mátyus: Multi-Aspect Candidates for Repositioning: Data Fusion Methods Using Heterogeneous Information Sources, *Current Medicinal Chemistry*, 2013, 20(1):95-107

Bence Bolgár, Ádám Arany, Gergely Temesi, Balázs Balogh, Péter Antal, Péter Mátyus Drug repositioning for treatment of movement disorders: from serendipity to rational discovery strategies, *Current topics in medicinal chemistry*, 2013;13(18):2337-63

G. Temesi, B. Bolgár, Á. Arany, C. Szalai, P. Antal, P. Mátyus: Early repositioning through Compound Set Enrichment Analysis: A knowledge recycling strategy, *Future Medicinal Chemistry*, 6(5):563-75, 2014

Javasolt témák és kurzusok

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 - Orvosi képfeldolgozás
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BME hírek ComBineLab-ról

- **Betegségek hálózata**

- http://www.bme.hu/hirek/20170824/Bayes-i_mesterseges_intelligencia_a_UK_Biobank_betegseg_adatainak_az_elemzeseben
- <http://diploma.vik.bme.hu/hir/2096-innovativ-biostatistikai-modszerek-a-multimorbiditas-kutatasara>

- **Génszekvenálás**

- https://www.bme.hu/hirek/20141222/A_BME_kutato_i_tesztelik_a_forradalmian_uj_DNS_szekvenalo_eszkozt
- <http://diploma.vik.bme.hu/hir/706/>

- **Mesterséges intelligencia a gyógyászatban**

- <https://www.mit.bme.hu/events/2019/06/03/mesterseges-intelligencia-gyogyaszatban>