Matemātika un datu zinātne

LU Studentu zinātniskais seminārs

2024. gada 16.oktobris

Jānis Lazovskis
Printful + RTU Rīgas Biznesa Skola

Ievads: Profesionālā pieredze

2009 - 2019:

2019 - 2024:

2020 - ... :

Izglītība ASV un Kanādā

- Bakalaura grāds kā pilna laika darbs
- Maģistra grādu matemātika parasti izlaiž
- Doktora grāds apvieno studijas un pētniecību

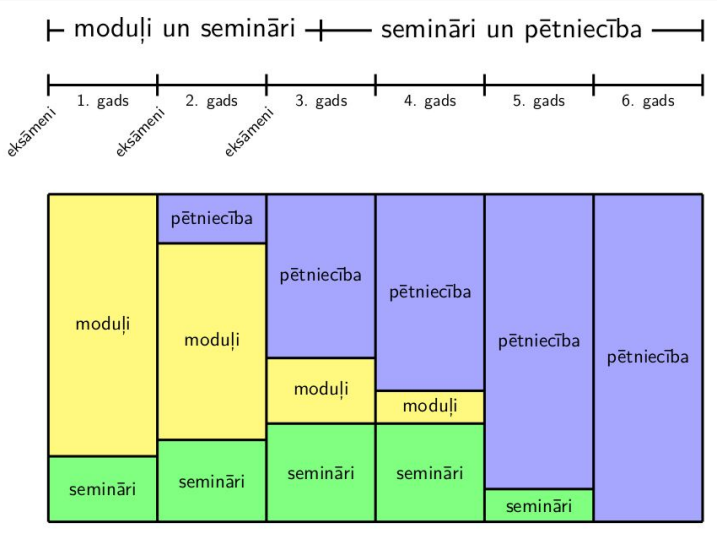
Course		Description
AMATH	391	From Fourier to Wavelets
LAT	102	Introductory Latin 2
PMATH	499	Readings in Pure Mathematics
Course Topic:		Algebraic Topology

Course		Description
ACINTY	640	Academic Integrity Module
PMATH	665	Differential Geometry
PMATH	745	Groups and Representations
PMATH	955	Topics in Geometry
Course Topic:		Advanced Algebraic Geometry

Winte

Program: Pure Mathematics, Master of Mathematics
Attendance: Full-Time Term: 2.00 Status: Enrolment

Course		Description
PMATH	764	Algebraic Curves
PMATH	800	Topics in Real and Complex Analysis
Course Topic:		Riemann Surfaces
PMATH	955	Topics in Geometry
Course Topic:		Atiyah-Singer Index Theorem

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MATH 516      Second Abstract Algebra I
MATH 533      Real Analysis I
MATH 589      Teaching Mathematics
        Ehrs: 10.00 GPA-Hrs: 10.00  QPts:

Spring 2015 - Chicago
  Graduate College
  Mathematics
MATH 517      Second Abstract Algebra II
MATH 535      Complex Analysis I
MATH 569      Adv Top In Geom&Diff Topology
MATH 596      Independent Study
        Ehrs: 13.00 GPA-Hrs: 13.00  QPts:

Fall 2015 - Chicago
  Graduate College
  Mathematics
MATH 549      Differentiable Manifolds I
MATH 552      Algebraic Geometry I
MATH 595      Research Seminar
MATH 596      Independent Study
MATH 547      Algebraic Topology I
MATH 568      Topics Algebraic Topology
MATH 593      Graduate Student Seminar
        Ehrs:  9.00 GPA-Hrs: 8.00   QPts:

Fall 2016 - Chicago
  Graduate College
  Mathematics
MATH 555      Complex Manifolds II
MATH 569      Adv Top In Geom&Diff Topology
MATH 596      Independent Study
        Ehrs:  9.00 GPA-Hrs: 9.00   QPts:

Spring 2017 - Chicago
  Graduate College
  Mathematics
MATH 553      Algebraic Geometry II
MATH 599      Thesis Research
        Ehrs:  9.00 GPA-Hrs: 4.00   QPts:
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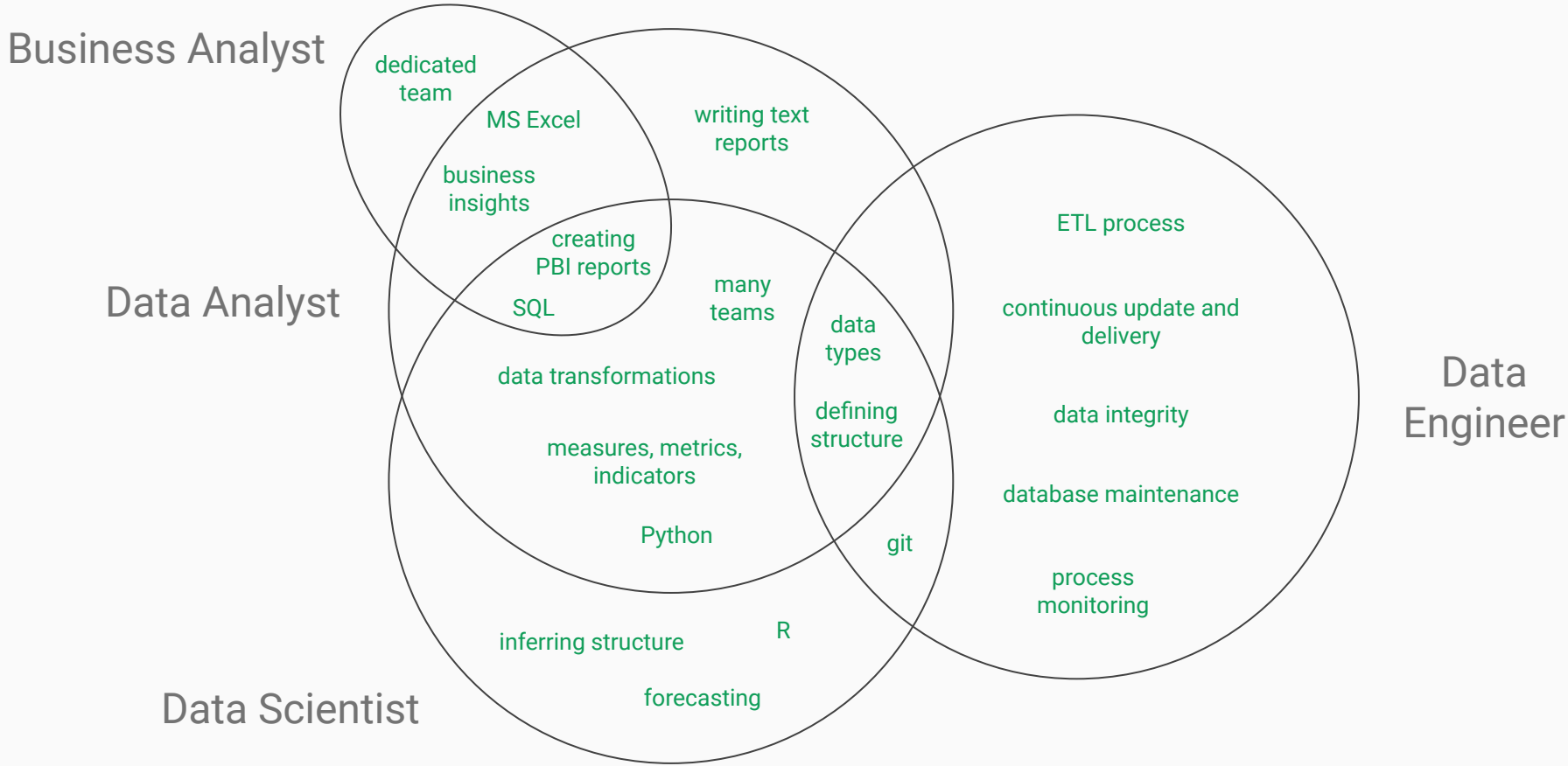
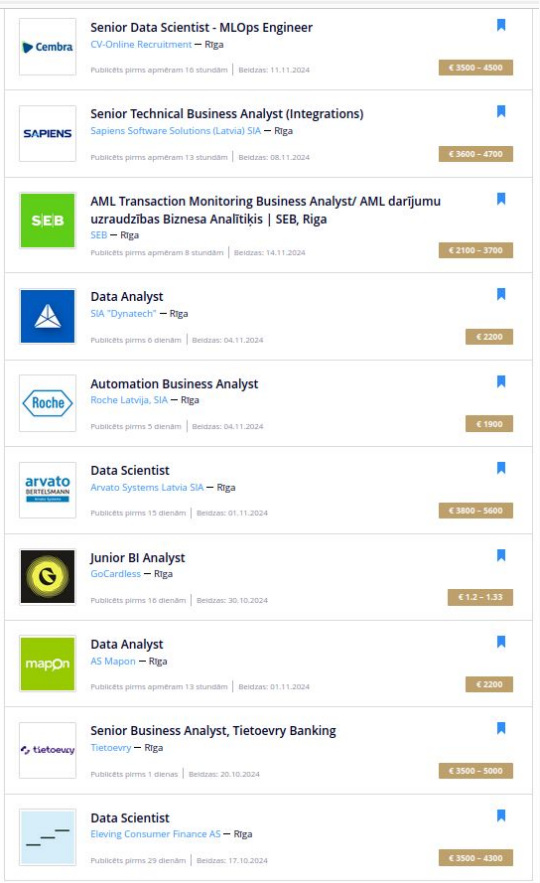
Datu zinātne

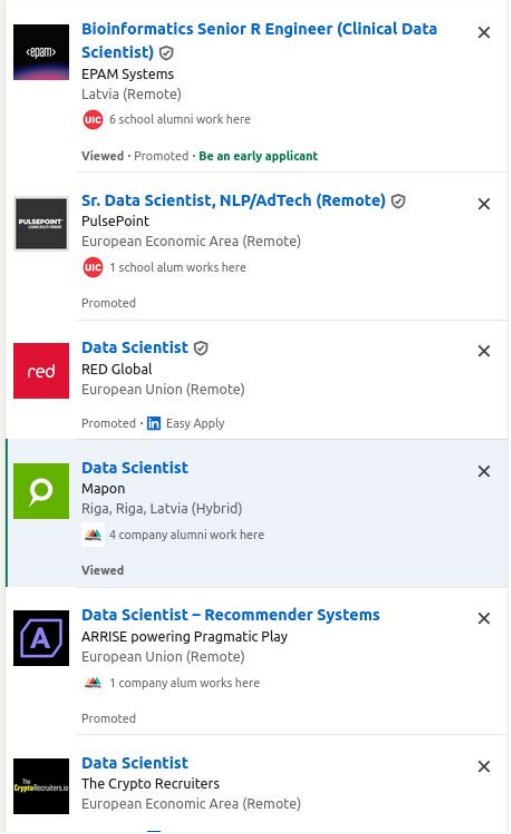
- Amata konteksts
- Vajadzības un atalgojums
- Situācija Latvijā un ārzemēs
- Kā alternatīva akadēmiskai karjerai

Ar datiem saistīti amati



Ar datiem saistīti amati





cv.lv / linkedin.com

Kādiem uzņēmumiem vajadzīgi datu zinātnieki?

- Bankām
- Farmācijas uzņēmumiem
- Vairumtirdzniecībai
- Tehnoloģiju uzņēmumiem

Uzņēmumiem, kas to var atļauties (naudas un laika ziņā)

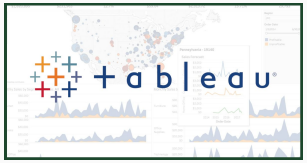
Printful: Data Analytics & Science

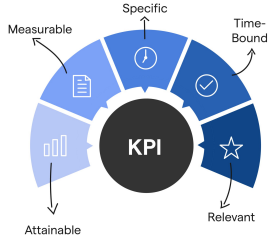
Ikdienas darbi un atbildības

- Creation and maintenance of PowerBI reports for other teams
- Deep dives, analytical reports on open questions
- Monthly, quarterly tasks and progress tracking

Rīki un programmēšana

- PowerBI (datu savienošana un vizualizācija)
- SQL (dažādos rīkos)
- Python, R, shell scripts
- Office tools (Google Docs, Sheets, Slides)





Akadēmisks darbs vs Darbs uzņēmuma: *Academia vs Industry*

Academia positives

- High autonomy
- Innovative tasks, exploration
- Direct impact on local people
- Eventually high job security (EU, US)

Industry positives

- Doing “real” work
- Good (LV) / high (EU, US) salary
- High level of activity
- Reasonable job security

Academia negatives

- Low job security (LV)
- Aging, conservative system (LV)
- Closed loop science
- Medium (EU, US) / low (LV) salary
- Bureaucracy

Industry negatives

- Medium / low autonomy
- Routine, repetitive tasks
- Capitalist machine
- Bureaucracy
- Indirect impact
- Academic achievements not valued

Matemātikas pētniecība

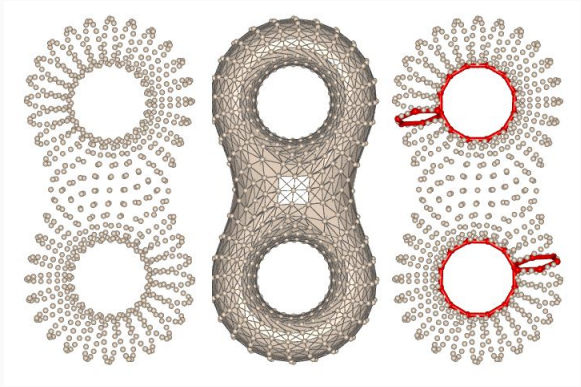
- Algebriskā topoloģija
- Persistent homology
- Applications of computational topology

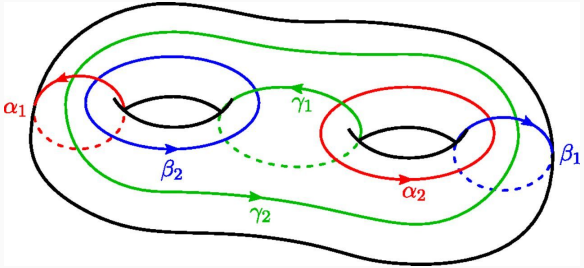
Topoloģija un ģeometrija

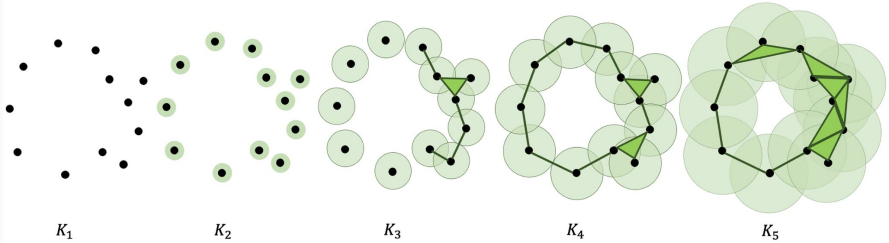
Algebraic topology (*algebriskā topoloģija*)
- Associating algebraic objects to topological spaces

Topological data analysis (*topoloģiskā datu analīze*)
- Associating topological characteristics to data

Computational geometry / computational topology
- Explicit descriptions of topological spaces



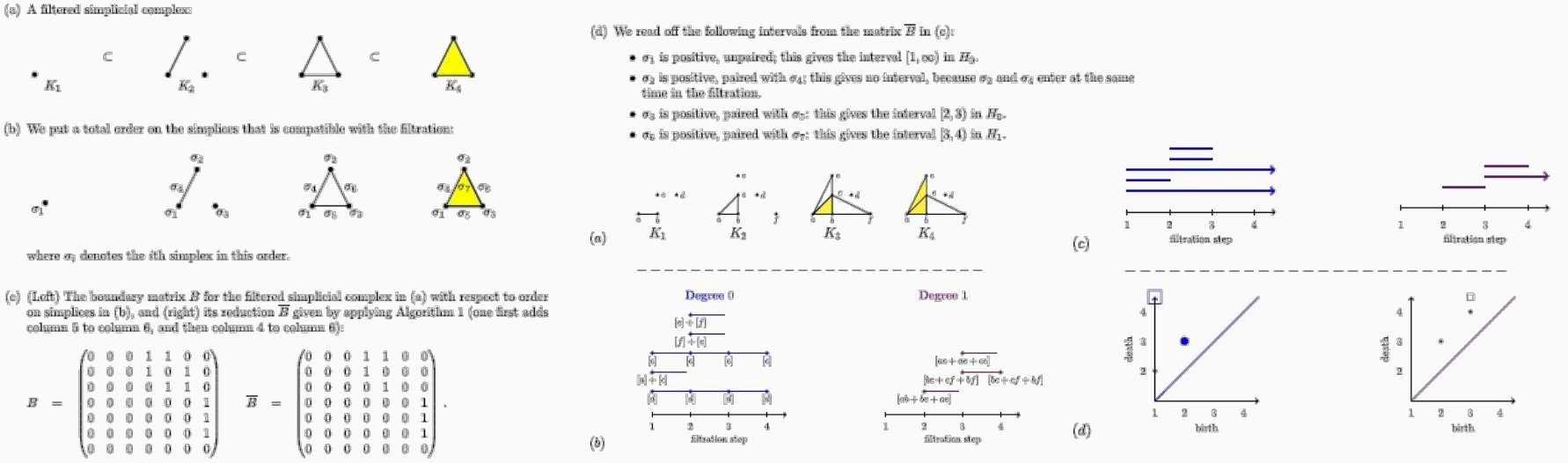




Feller et al / MLD De Lara / Dey-Wang

Persistent homology & dynamic data

Topological structure	→	algebraic structure
Topological simplification	→	matrix reduction
Topological features	→	multiset

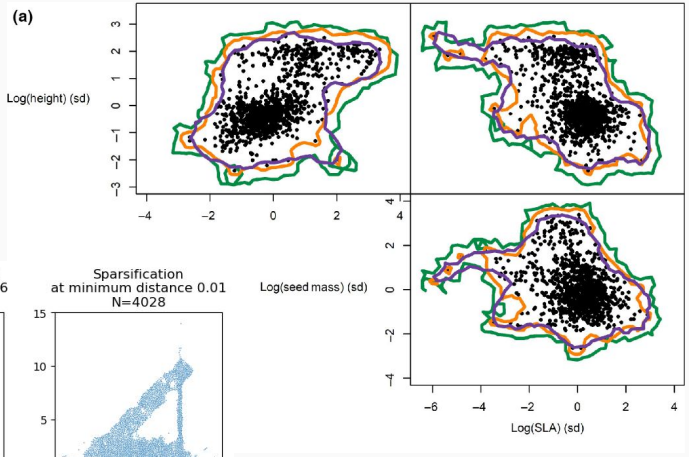


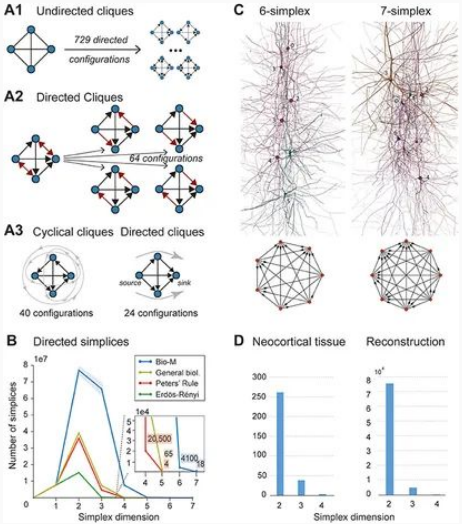
Otter et al

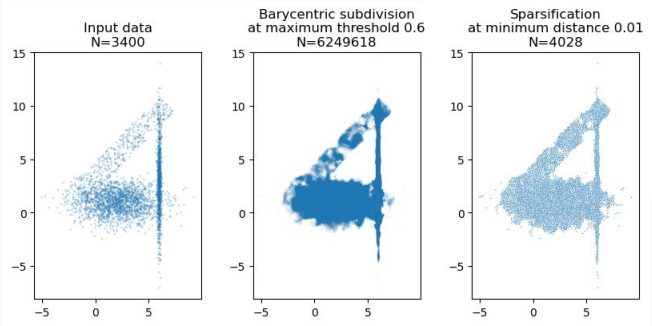
Applications to natural sciences

Neuroscience

- The brain may be viewed as a directed graph
- The clique complex is a topological space
- Neuron activity gives time-dependent subgraphs



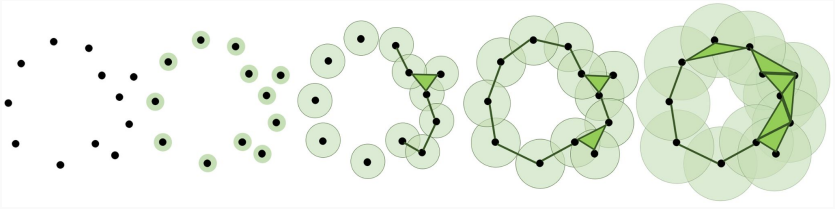




Ecology

- Species observations are in a high dimensional space
- Voids in this space create opportunity for takeover

1. Datu zinātne
2. Matemātika un topoloģija



Avoti:

- CV.lv, LinkedIn.com, Printful.com
- Allen Hatcher, Algebraic Topology
- Tamal Dey, Yusu Wang, Computational Topology for Data Analysis
- Otter et al, A roadmap for the computation of persistent homology
- Reimann et al, Cliques of Neurons Bound into Cavities Provide a Missing Link between Structure and Function
- Conceição et al, An application of neighbourhoods in digraphs to the classification of binary dynamics
- Blonder et al, New approaches for delineating n-dimensional hypervolumes