Exam information:
▶ Date: January 8, 2018
▶ Time: 14:00 - 15:00
▶ Location: 2.A.01
▶ Form: written, closed book

Solve examples (use exercises for preparation)
Understand principles (multiple choice, analyze solutions)

Coalescing, Time Domain, Time Granularity

▶ Coalescing
  ▶ SQL, procedural, analytic functions

▶ Time domain:
  ▶ Time domain: set of instants with a total order
  ▶ Structure of time: linear versus branching
  ▶ Density of time: discrete, dense, continuous
  ▶ Boundness of time: bound versus unbound
  ▶ Relative (unanchored) versus absolute (anchored) time

▶ Time granularity and calendars
  ▶ A granularity partitions the time line (chronons) into a set of granules
  ▶ The granules are labeled with their distance from the anchor point.
  ▶ A granularity maps a label to the corresponding set of chronons.
  ▶ A calendar is generated from a single bottom granularity through granularity operations.

Temporal Data Models


▶ Modeling temporal model: \( M = (DS, QL) \)
  ▶ Dimensions of time: valid time, transaction time, ...
  ▶ Types of timestamps: points, periods, elements
  ▶ Semantics of timestamps: point versus interval semantics
  ▶ Scope of timestamps: tuple versus attribute timestamping

▶ Temporal data models
  ▶ Snodgrass’s tuple timestamped data model
  ▶ Jensen’s backlog data model
  ▶ Ben-Zvi tuple timestamped data model
  ▶ Gadia’s attribute value timestamped data model

▶ Temporal query languages:
  ▶ SQL + ADT, IXSQL, SQL/TP, TSQL2, ATSQL

Sequenced Semantics


▶ Snapshot equivalence: \( \tau^V_{\delta_1}(\rho^B_{\delta_1}(r)) = \tau^V_{\delta_1}(\rho^B_{\delta_1}(s)) \)

▶ Snapshot reducibility: \( \tau^V_{\delta}(r \times^V s) \equiv \tau^V_{\delta}(r) \times \tau^V_{\delta}(s) \)

▶ Sequenced semantics: properties and implementation
  ▶ alignment of time intervals
  ▶ two new algebraic primitives:
    ▶ normalize
    ▶ align
  ▶ Temporal extension of PostgreSQL
Spatial Database Systems


- A *spatial database system* is a database system with principled support for handling spatial data

- **Key Components of a Spatial Database System**
  - Representations for the data types (points, lines, regions) of a spatial algebra
  - Spatial index structures (z-order, kD tree, space transformation, R tree)
  - Filter and refine techniques

Spatial Network Databases


  - Dijkstra’s single source shortest path
  - Incremental Euclidean Restriction (IER)
  - Incremental Network Expansion (INE)

Thanks

- All the best for the exam!

- Thanks for course evaluation. Any other comments about course, project, literature, etc is welcome.

- I am happy to discuss BSc and MSc theses, PhDs, internships, tutoring, summer jobs, projects with external companies, etc.

- DBTG is a good match if you like
  - to be precise,
  - algorithms,
  - a healthy mix of implementation and analysis,
  - real world data and problems.