Administrivia – Final Exam

• **Who:** You
• **What:** [http://cmudb.io/f16-final](http://cmudb.io/f16-final)
• **When:** Tuesday Dec 13\(^{th}\) @ 5:30pm
• **Where:** Margaret Morrison
  – Room 103: 'Chen' to 'Lyu' (inclusive)
  – Room A14: 'Merigoux' to 'Zimmerman'
• **Why:** Because otherwise Christos and I call your family over the break…

Administrivia – Course Evals

• **What to bring:**
  – CMU ID
  – Calculator
  – Two pages of notes (double-sided)
• **What not to bring:**
  – Live animals

• Your feedback is strongly needed:
  – [https://cmu.smartevals.com](https://cmu.smartevals.com)
• Things that we want feedback on:
  – Homework Assignments
  – Reading Materials
  – Lectures
Extended Office Hours

- **Andy:**
  - Friday Dec. 9th @ 1:00pm-2:30pm
- **Christos:**
  - Monday Dec. 12th @ 12:00pm-3:00pm

Stuff Before Mid-Term

- SQL
- Sorting

Query Optimization & Evaluation

- **Operator Algorithms:**
  - **Selections:** Access paths
  - **Projections & Group Bys:** Hashing vs. Sorting
  - **Joins:** Nested Loop, Index Nested Loop, Sort-Merge, Grace Hash
- **Cost Estimations**

Schema Refinement

- **Functional Dependencies**
  - Armstrong’s Axioms
  - Closures
  - Canonical Covers
  - Super Key vs. Candidate Key
Normalization

- Decomposition:
  - Loseless Joins
  - Dependency Preserving
  - Redundancy Avoidance
- Normal Forms
  - 1NF, 3NF, BCNF

Database Design & Tuning

- Index Selection & Clustering
- Denormalization
- Decomposition

Transactions

- ACID
- Conflict Serializability:
  - How to check?
  - How to ensure?
- View Serializability

Transactions

- Two-Phase Locking
  - Strict vs. Non-Strict
  - Deadlock Detection & Prevention
- Multiple Granularity Locking
  - Intention locks
- B+Tree Latch Crabbing
- Isolation Levels / Anomalies
Transactions

- Timestamp Ordering Concurrency Control
  - Thomas Write Rule
- Optimistic Concurrency Control
  - Read Phase
  - Validation Phase
  - Write Phase
- Multi-Version Concurrency Control

Crash Recovery

- Buffer Pool Policies:
  - STEAL vs. NO-STEAL
  - FORCE vs. NO-FORCE
- Write-Ahead Logging
- Logging Schemes
- Basic Recovery

Distributed Databases

- Partitioning Schemes
- Two-Phase Commit

Column Stores

- DSM vs. NSM
  - Advantages
  - Disadvantages
- Compression Schemes
Data Warehouses + Mining

• Data cubes
  – CUBE BY
  – ROLAP vs. MOLAP

• Data Mining
  – Supervised Learning (Decision Trees)
  – Unsupervised Learning (Assoc. Rules)