Administrivia – Final Exam

- **Who:** You
- **What:** [http://cmudb.io/s15-final](http://cmudb.io/s15-final)
- **When:** Monday May 11th 5:30pm - 8:30pm
- **Where:** GHC 4401
- **Why:** You lost all your money betting on the Mayweather vs. Pacquiao fight.

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)
Extended Office Hours

- Monday May 4: Andy 12:00–1:00
- Tuesday May 5: Andy 12:00–1:00
- Wednesday May 6: Christos 12:00–1:00
- Thursday May 7: Christos 1:00–3:00
- Friday May 8: Christos 2:00–3:00

Stuff Before Mid-Term

- SQL

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
- Query Tuning / Rewriting

Transactions

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

Transactions

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

- Buffer Pool Policies:
  - STEAL vs. NO-STEAL
  - FORCE vs. NO-FORCE
- Write-Ahead Logging
- Logging Schemes
- ARIES Recovery
  - Phases: Analyze, Redo, Undo

Data Warehouses + Mining

- Data cubes
  - CUBE BY
  - ROLAP vs. MOLAP
- Data Mining
  - Supervised Learning (Decision Trees)
  - Unsupervised Learning (Assoc. Rules)