# PROJECT 1

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1. Relational Schema and Normalization (BCNF) (Q3)

Relational Schema:

- Student
  Student(**student_id**, name, university, major, graduation_year)
- Company
  Company(**company_id**, company_name, industry, hq_location)
- JobPosting
  JobPosting(**job_id**, company_id → Company.company_id, title, location_mode, job_type)
- Application
  Application(**app_id**, student_id → Student.student_id, job_id → JobPosting.job_id, submission_date, current_status, notes)
- InterviewRound
  InterviewRound(**round_id**, app_id → Application.app_id, round_type, scheduled_date, outcome, notes)
- Tag
  Tag(**tag_id**, tag_name)
- ApplicationTag
  ApplicationTag(
  **app_id** → Application.app_id,
  **tag_id** → Tag.tag_id,
  PRIMARY KEY (app_id, tag_id)
  )
- Contact
  Contact(**contact_id**, company_id → Company.company_id, contact_name, role, email, phone)
- ApplicationContact
  ApplicationContact(
  **app_id** → Application.app_id,
  **contact_id** → Contact.contact_id,
  PRIMARY KEY (app_id, contact_id)
  )
- Offer
  Offer(
  **offer_id**,

app_id UNIQUE → Application.app_id,
compensation,
deadline,
offer_notes
)

This schema reflects the following relationships described in the business rules:

- A student can submit many applications, but each application belongs to exactly one student.
- A company can have many job postings.
- Each application targets exactly one job posting.
- An application can have multiple interview rounds.
- An application can have one or more tags.
- A student can store contacts at a company and associate them with an application.
- An application can have at most one offer record.

Functional Dependencies and BCNF Proof:

**Student**
FDs:
student_id → name, university, major, graduation_year

Candidate Key:
{student_id}

Since the only determinant is a candidate key, Student is in BCNF.

**Company**
FDs:
company_id → company_name, industry, hq_location

Candidate Key:
{company_id}

All determinants are superkeys.
Therefore, Company is in BCNF.

**JobPosting**
FDs:
job_id → company_id, title, location_mode, job_type

Candidate Key:
{job_id}

All determinants are superkeys.
Therefore, JobPosting is in BCNF.

**Application**
FDs:
app_id → student_id, job_id, submission_date, current_status, notes

Candidate Key:
{app_id}

All determinants are superkeys.
Therefore, Application is in BCNF.

**InterviewRound**
FDs:
round_id → app_id, round_type, scheduled_date, outcome, notes

Candidate Key:
{round_id}

All determinants are superkeys.
Therefore, InterviewRound is in BCNF.

**Tag**
FDs:
tag_id → tag_name

Candidate Key:
{tag_id}

All determinants are superkeys.
Therefore, Tag is in BCNF.

**ApplicationTag**
FDs:
(app_id, tag_id) → ∅

Candidate Key:
{app_id, tag_id}

There are no non-trivial dependencies other than the composite key.
Therefore, ApplicationTag is in BCNF.

**Contact**
FDs:
contact_id → company_id, contact_name, role, email, phone

Candidate Key:
{contact_id}

All determinants are superkeys.
Therefore, Contact is in BCNF.

**ApplicationContact**
FDs:
(app_id, contact_id) → ∅

Candidate Key:
{app_id, contact_id}

There are no non-trivial dependencies other than the composite key.
Therefore, ApplicationContact is in BCNF.

**Offer**
FDs:
offer_id → app_id, compensation, deadline, offer_notes
app_id → offer_id, compensation, deadline, offer_notes

Candidate Keys:
{offer_id}
{app_id}

Because app_id is declared UNIQUE, both offer_id and app_id function as candidate keys. Therefore, all determinants are superkeys.

Therefore, Offer is in BCNF.