Supply Optimization Simulation — Interview Brief (BGSU)

Scope

Prototype a solver■based allocation model to match limited Learning Commons resources (tutors, coaching slots, math/writing lab seats) to student demand to maximize completed sessions and equity while minimizing wait time and no■shows. Context: Bowling Green State University (BGSU) Student Success Analytics. Cohort focus is first■year undergraduates. Primary KPI: next■term retention; secondary: term GPA, gateway pass rate, early-course engagement. Data sources: SIS, LMS, advising, Learning Commons outreach logs.

Business Questions

- How many tutors and seats should be scheduled by hour and subject to meet demand SLAs?
- Which rebalancing policy (move tutors across subjects/locations) reduces peak backlogs?
- What is the trade■off between utilization and wait time (service level)?

Methodology (Plain)

- Formulate a mixed■integer linear program (MILP): decision variables = assignments of students to time■slot×service×location; objective = maximize total attended sessions with penalties for long waits and unserved requests; constraints = staff availability, skills/subjects, location capacities, equity targets.
- Add rebalancing heuristic for real■time adjustments (rolling horizon).
- Build a discrete■event simulation using historical arrival patterns (hour×service) and no■show probabilities.
- Compare policies: status quo scheduling vs. MILP vs. heuristic rebalancing; report service metrics (fill rate, avg/p90 wait), staff utilization, fairness indices.
- Perform scenario stress■tests (midterm spikes, weather closures).

Tools

- Python: pulp or ortools (MILP), numpy/pandas, simpy (discrete■event simulation).
- Data: historical bookings, tutor rosters/skills, lab capacities, class calendars.
- Visualization: matplotlib for policy comparison dashboards.

Potential Results (Example framing)

- MILP scheduling raises attended sessions by 6–10% with same staffing; p90 wait drops from 45→28 minutes in gateway■math during midterms.
- Equity guardrail ensures Pell■eligible/first■gen students' access rate within ±2 pp of overall average.
- Recommendation: adopt MILP schedule weekly; add rolling 30■min rebalancing during peaks.

Interview Talking Points (60–90s)

- Translate 'supply optimization' to student services: right tutor, right time, minimal wait.

- Keep it simple: objective, top constraints, one headline result, one operational change.
- Note production path: export schedule + simple rebalancing rule for coordinators.

Risks & Mitigations

- Data latency/forecast error → quantify with scenario envelopes; reserve buffer capacity.
- Adoption risk → co■design with coordinators; start with one subject/location.