# HUDK 4050:CORE METHODS IN EDM

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# Q-Matrices

Concepts are defined by experts. Very time consuming & domain specific

# Q-Matrix

| | q1 | q2 | q3 | q4 | q5 | q6 |
|---|---|---|---|---|---|---|
| **con1** | 1 | 0 | 0 | 0 | 0 | 1 |
| **con2** | 1 | 1 | 0 | 1 | 0 | 0 |
| **con3** | 1 | 1 | 1 | 0 | 0 | 0 |

(Tatsuoka, 1983;1996)

Probability a student is correct given mastery of a given concept

# Q-Matrix

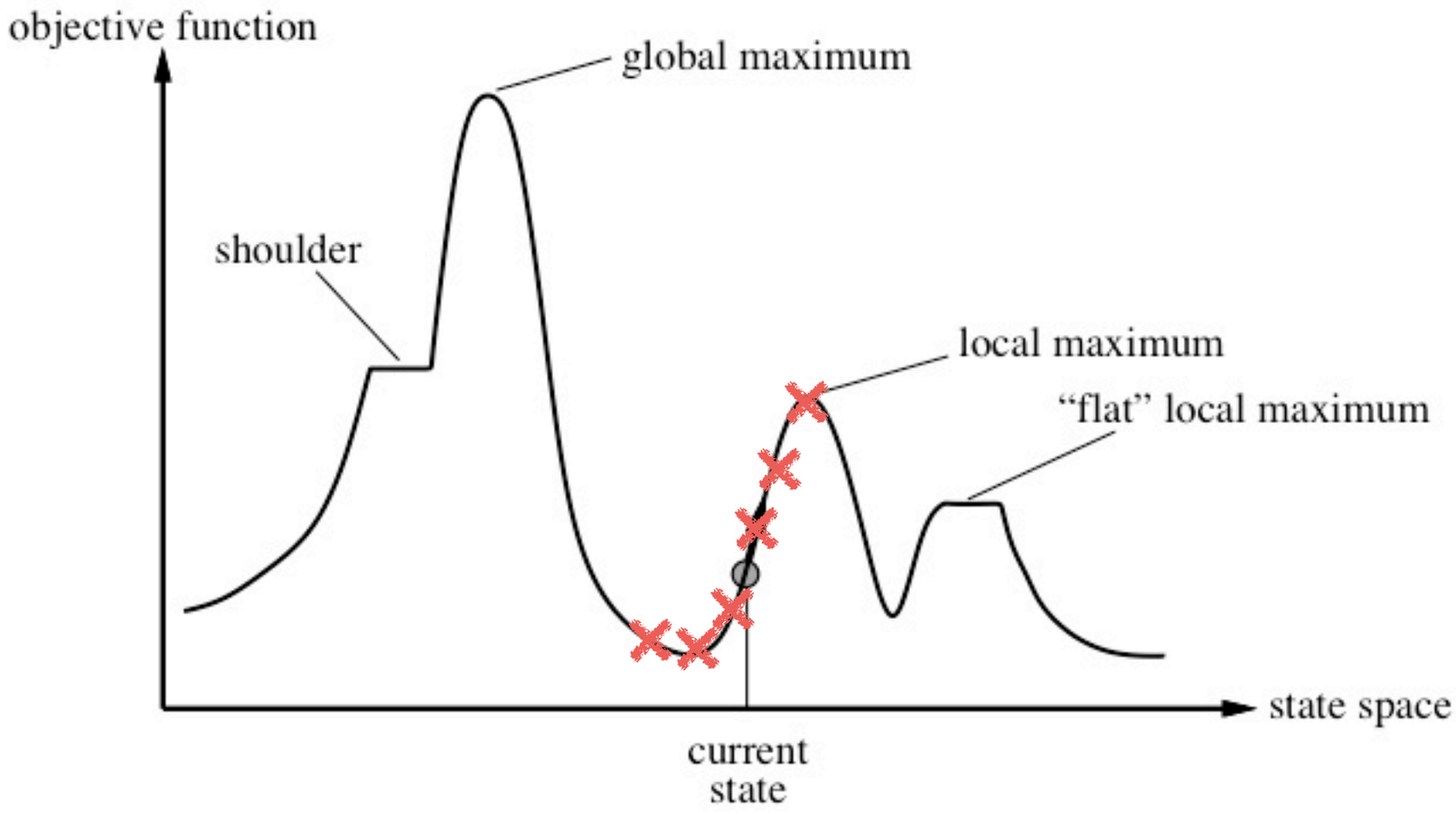
| | q1 | q2 | q3 | q4 | q5 | q6 |
|---|---|---|---|---|---|---|
| **con1** | 1 | 0.01 | 0.6 | 0 | 0.7 | 1 |
| **con2** | 0.8 | 0.7 | 0.8 | 0.76 | 0.5 | 0.42 |
| **con3** | 0.5 | 0.6 | 1 | 0.55 | 0.5 | 0.67 |

(Brewer , 1996)

# One Solution

- Create idealized patterns
- Compare the observed pattern to the idealized
- Use difference between them as an indicator of “model fit”

# Hill Climbing Algorithm




- If we stop too early might only capture a local maxima
- This is a "heuristic" algorithm - when problem is not algebraically solvable or would take too long
- State description contains all the information needed to find a solution

# Idealized Pattern

| | q1 | q2 | q3 | q4 | q5 | q6 |
|---|---|---|---|---|---|---|
| **c1** | 1 | 0 | 0 | 0 | 0 | 1 |
| **c2** | 1 | 1 | 0 | 1 | 0 | 0 |
| **c3** | 1 | 1 | 1 | 0 | 0 | 0 |

Student Answer: 101110

| Concept State | Ideal Response Vector |
|---|---|
| 000 | 000010 |
| 001 | 001010 |
| 010 | 000110 |
| 011 | 011110 |
| 100 | 000011 |
| 101 | 001011 |
| 110 | 000111 |
| 111 | 111111 |

$$L_1 = \quad d(p,IDR) = \sum_q |p(q) - IDR(q)|$$

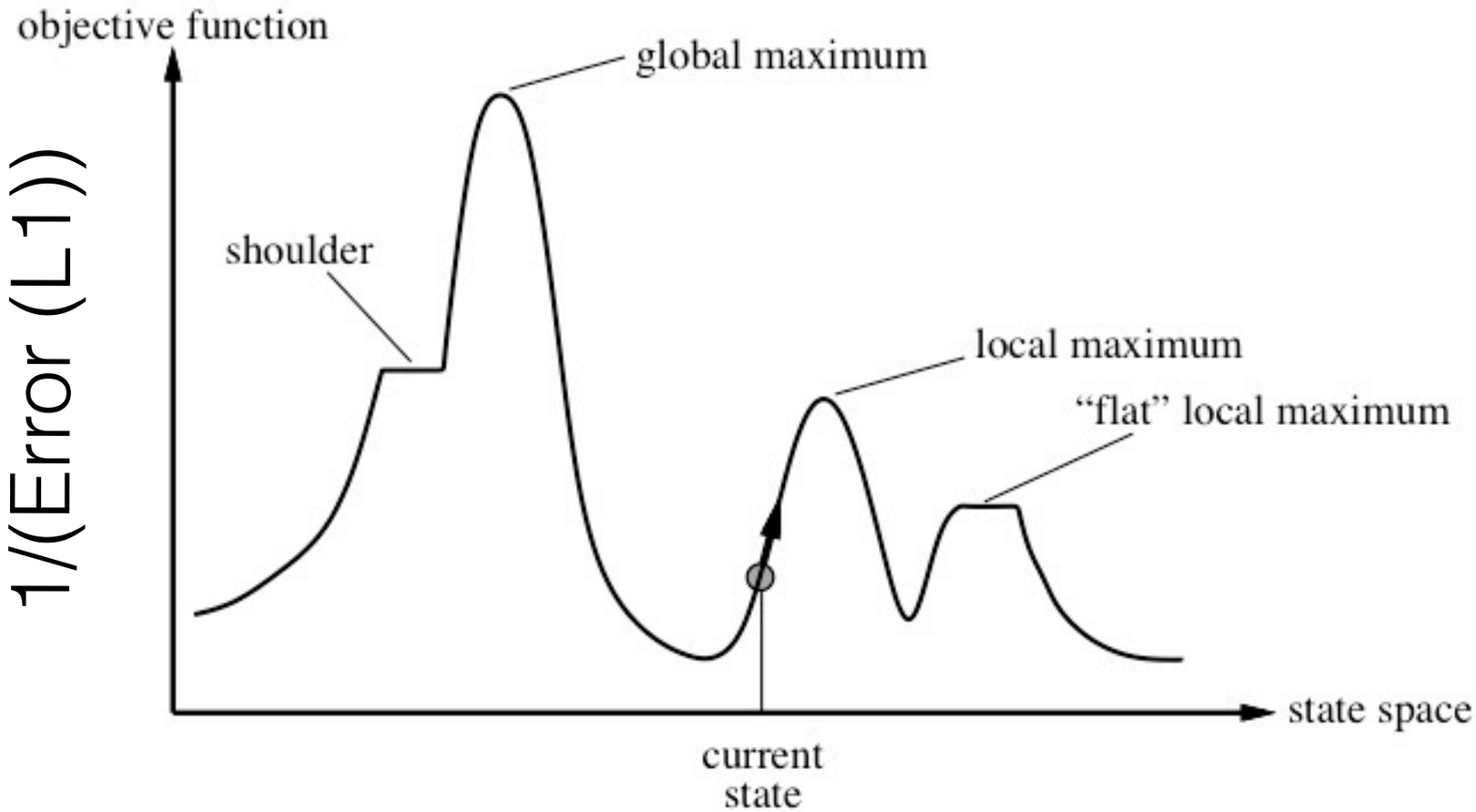
$$L_1 = 1$$

# Idealized Pattern

| | q1 | q2 | q3 | q4 | q5 | q6 |
|---|---|---|---|---|---|---|
| **c1** | 1 | 0 | 0 | 0 | 0 | 1 |
| **c2** | 1 | 1 | 0 | 1 | 0 | 0 |
| **c3** | 1 | 1 | 1 | 0 | 0 | 0 |

$$L_1 = \quad d(p,IDR) = \sum_q |p(q) - IDR(q)|$$

| Concept State | Students |
|---|---|
| 000 | A,D,X |
| 001 | B,M,N |
| 010 | C,E |
| 011 | F,G,H |
| 100 | I,J,K,L |
| 101 | O,W |
| 110 | P,Q,R,S |
| 111 | T,U,V,Z |




| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | Q1 |
| 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | Q2 |
| 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | Q3 |
| 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | Q4 |

# Answers

| | Q1 | Q2 | Q3 | Q4 | Q5 | Q8 | Q9 | Q8 | Q9 | Q10 | Q11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Ans** | 2 | 4 | 3 | 4 | 2 | 4 | 2 | 2 | 3 | 3 | 4 |

# Q-Matrix

| | q1 | q2 | q3 | q4 | q5 | q6 | q7 | q8 | q9 | q10 | q11 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **c1** | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | |
| **c2** | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | |
| **c3** | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | |
| **c4** | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | |
| **c5** | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | |

| Concept State | IDR |
|---|---|
| **00000** | 00000000000 |
| **00001** | 00000010000 |
| **00010** | 00010000000 |
| **00011** | 00010010000 |
| **10100** | 10100000101 |
| **10101** | 10100010111 |
| **10111** | 11110011111 |
| **11000** | 00101000000 |
| **11100** | 10101000101 |
| **11110** | 11111100101 |
| **01111** | 00010110111 |
| **01000** | 00000000000 |
| **01010** | 00000100000 |
| **01101** | 00010010111 |
| **01110** | 00010100101 |
| **11111** | 11111111111 |

- Find the IDR closest to your own
- There are two “all zero”
- Count how many digits are different to your answer

What are we gonna do with that Twitter?

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# Activity

- Break into groups
- Agree on a goal for the platform use by the class
- Devise an intervention to target that goal
- Devise a way to monitor the impact of the intervention
- Pitch