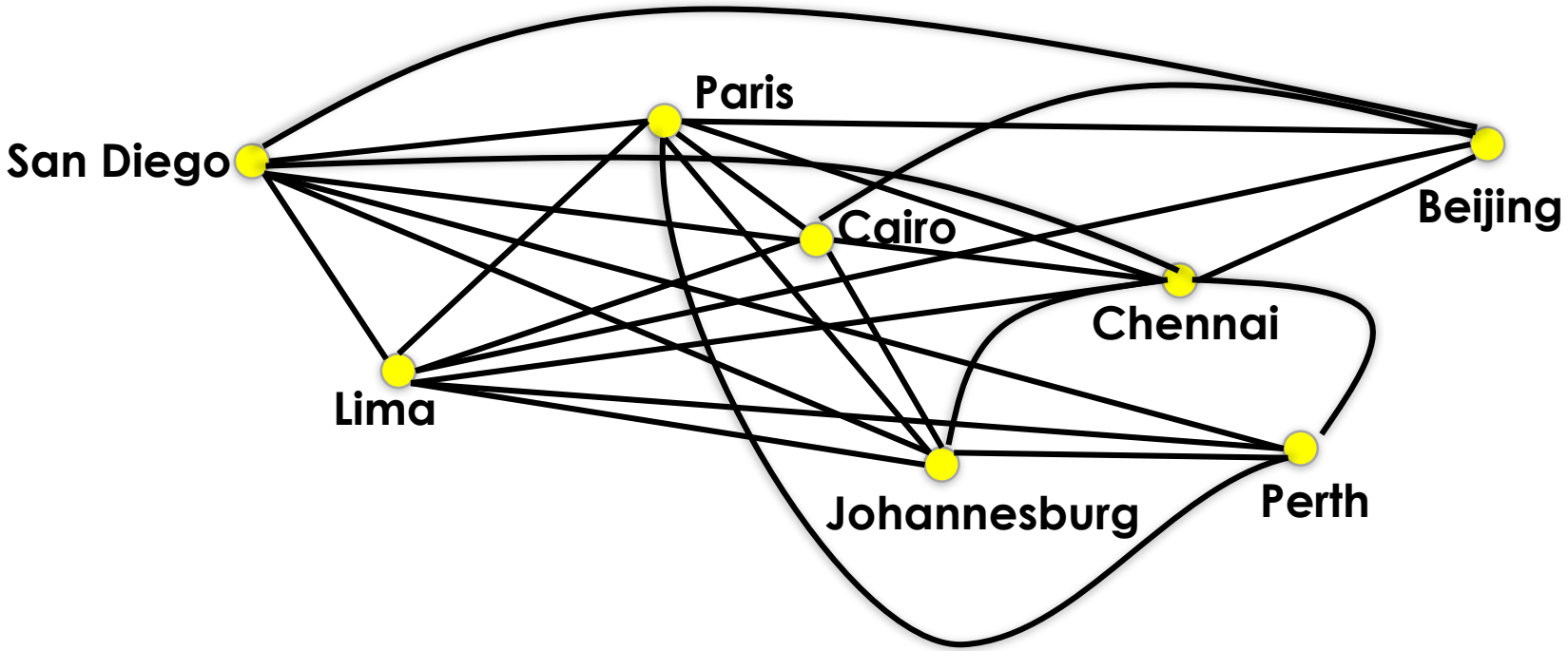
Traveling Salesperson Problem (TSP)

Brute-force algorithm

By the end of this video you will be able to…

- Describe a brute-force algorithm for the Traveling Salesperson Problem

In TSP, given n cities with one Hometown and all pairwise distances, plan a tour starting and ending at Hometown that visits every city exactly once and has minimum distance.



In TSP, given n cities with one Hometown and all pairwise distances, plan a tour starting and ending at Hometown that visits every city exactly once and has minimum distance.

	SD	Lima	Paris	Chen.	Cairo	Perth	Beij.	J'berg
SD	0	6,091	9,144	14,587	12,276	15,078	10,234	16,575
Lima	6,091	0	10,248	17,540	12,414	14,924	16,637	10,872
Paris	9,144	10,248	0	8,031	3210	14,269	8,212	8,295
Chen.	14,587	17,540	8,031	0	5,360	6,276	4,615	7,133
Cairo	12,276	12,414	3210	5,360	0	11,258	7,540	6,260
Perth	15,078	14,924	14,269	6,276	11,258	0	7,985	8,308
Beij.	10,234	16,637	8,212	4,615	7,540	7,985	0	11,699
J'berg	16,575	10,872	8,295	7,133	6,260	8,308	11,699	0

Just try all paths and choose the shortest!

Brute force approach

In TSP, given n cities with one Hometown and all pairwise distances, plan a tour starting and ending at Hometown that visits every city exactly once and has minimum distance.

Brute force algorithm: Generate all paths and choose the shortest

SD → Lima → Paris → Cairo → Perth → Beijing → Johannesburg → Chennai → San Diego

6,091 + 10,248 + 3210 + 11,258 + 7,985 + 11,699 + 7,133 + 14,587 = 72,211km

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Brute force algorithm: Generate all paths and choose the shortest

SD → Lima → Paris → Cairo → Perth → Beijing → Johannesburg → Chennai → San Diego

6,091 + 10,248 + 3210 + 11,258 + 7,985 + 11,699 + 7,133 + 14,587 = 72,211km

SD → Lima → Paris → Cairo → Perth → Beijing → Chennai → Johannesburg → San Diego

6,091 + 10,248 + 3210 + 11,258 + 7,985 + 4,615 + 7,133 + 16,575 = 67,115km

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Brute force algorithm: Generate all paths and choose the shortest

SD → Lima → Paris → Cairo → Perth → Beijing → Johannesburg → Chennai → San Diego

6,091 + 10,248 + 3,210 + 11,258 + 7,985 + 11,699 + 7,133 + 14,587 = 72,211km

SD → Lima → Paris → Cairo → Perth → Beijing → Chennai → Johannesburg → San Diego

6,091 + 10,248 + 3,210 + 11,258 + 7,985 + 4,615 + 7,133 + 16,575 = 67,115km

SD → Lima → Paris → Cairo → Perth → Johannesburg → Beijing → Chennai → San Diego

6,091 + 10,248 + 3,210 + 11,258 + 8,308 + 11,699 + 4,615 + 14,587 = 70,016km

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Brute force algorithm: Generate all paths and choose the shortest

SD → Lima → Paris → Cairo → Perth → Beijing → Johannesburg → Chennai → San Diego

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SD → Lima → Paris → Cairo → Perth → Beijing → Chennai → Johannesburg → San Diego

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SD → Lima → Paris → Cairo → Perth → Johannesburg → Beijing → Chennai → San Diego

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. . .

In TSP, given n cities with one Hometown and all pairwise distances, plan a tour starting and ending at Hometown that visits every city exactly once and has minimum distance.

Brute force algorithm: Generate all paths and choose the shortest

SD → Lima → Paris → Cairo → Perth → Beijing → Johannesburg → Chennai → San Diego

6,091 + 10,248 + 3,210 + 11,258 + 7,985 + 11,699 + [illegible]7,133 + 14,587 = 72,211km

SD → Lima → Paris → Cairo → Perth → Beijin[illegible] → Johannesburg → San Diego

6,091 + 10,248 + 3,210 + 11,25[illegible]4,615 + 7,133 + 16,575 = 67,115km

It works!!

SD → Lima → Pari[illegible] Perth → Johannesburg → Beijing → Chennai → San Diego

6,091 + 10,24[illegible] 3,210 + 11,258 + 8,308 + 11,699 + 4,615 + 14,587 = 70,016km

. . .

In TSP, given n cities with one Hometown and all pairwise distances, plan a tour starting and ending at Hometown that visits every city exactly once and has minimum distance.

Brute force algorithm: Generate all paths and choose the shortest

SD → Lima → Paris → Cairo → Johannesburg → Perth → Chennai → Beijing → San Diego

6,091 + 10,248 + 3,210 + 6,260 + 8,308 + 6,276 + 4,615 + 10,234 = 55,242km

But how long does it take…?