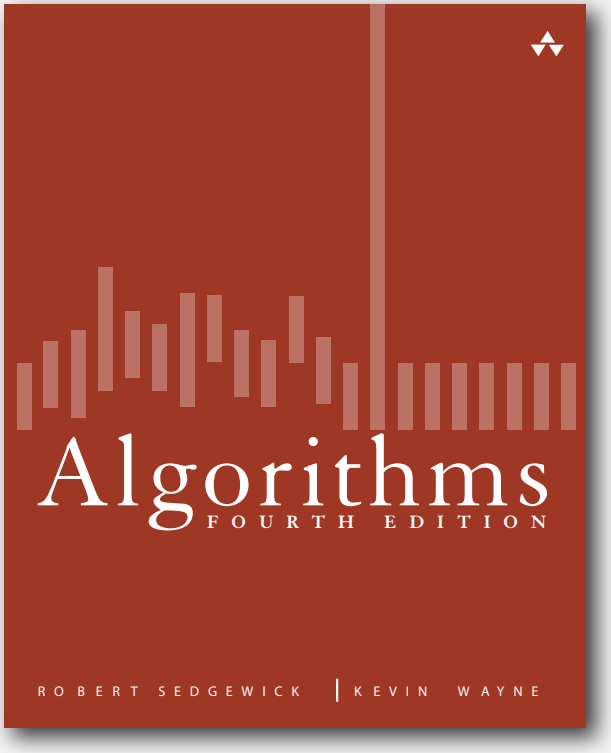
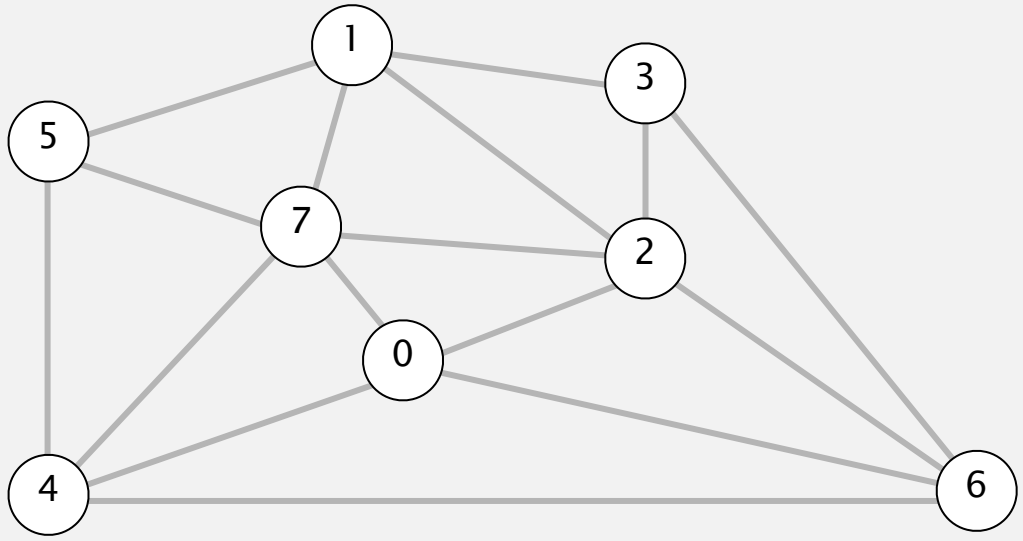
# 4.3 Greedy Algorithm Demo



## Greedy MST algorithm

- Start with all edges colored gray.
- Find a cut with no black crossing edges, and color its min-weight edge black.
- Continue until $V - 1$ edges are colored black.




an edge-weighted graph

```
0-7  0.16
2-3  0.17
1-7  0.19
0-2  0.26
5-7  0.28
1-3  0.29
1-5  0.32
2-7  0.34
4-5  0.35
1-2  0.36
4-7  0.37
0-4  0.38
6-2  0.40
3-6  0.52
6-0  0.58
6-4  0.93
```

# Greedy MST algorithm

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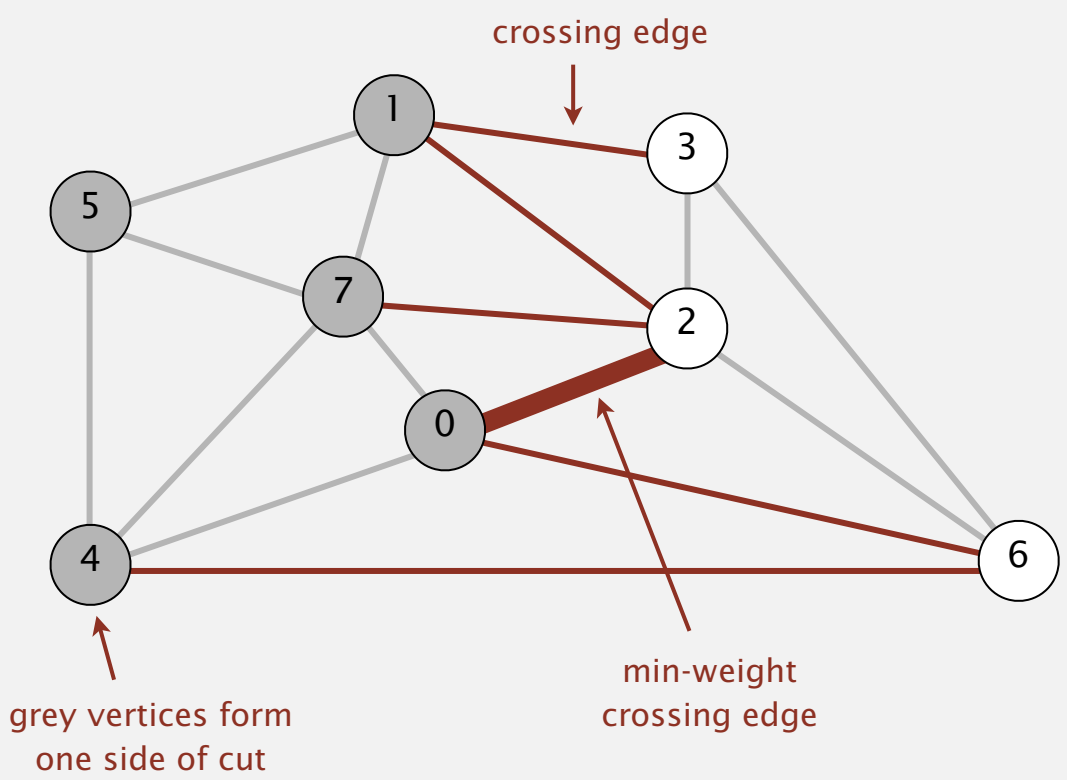


crossing edges
(sorted by weight)

| | | |
|---|---|---|
| in MST → | 0-2 | 0.26 |
| | 1-3 | 0.29 |
| | 2-7 | 0.34 |
| | 1-2 | 0.36 |
| | 6-0 | 0.58 |
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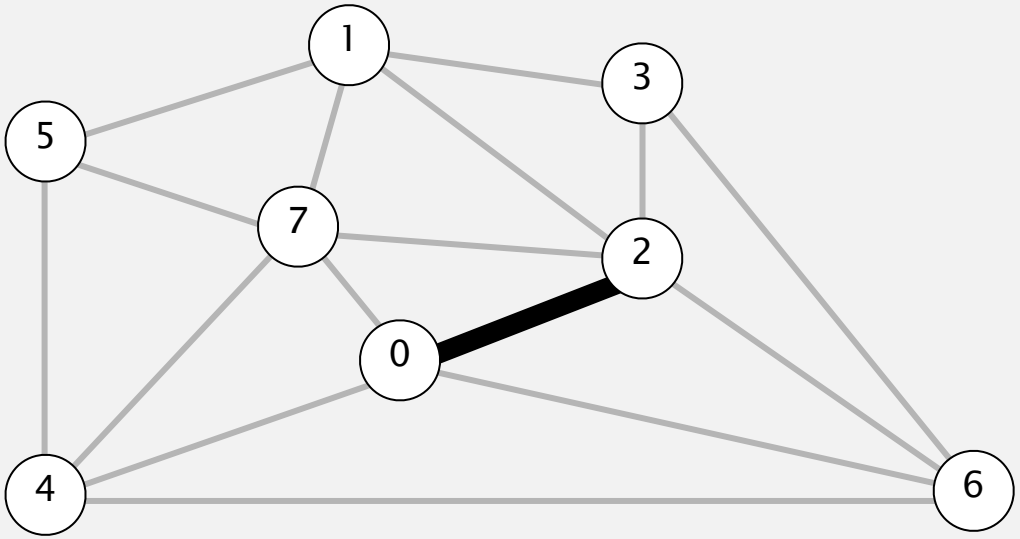


**MST edges**

0-2

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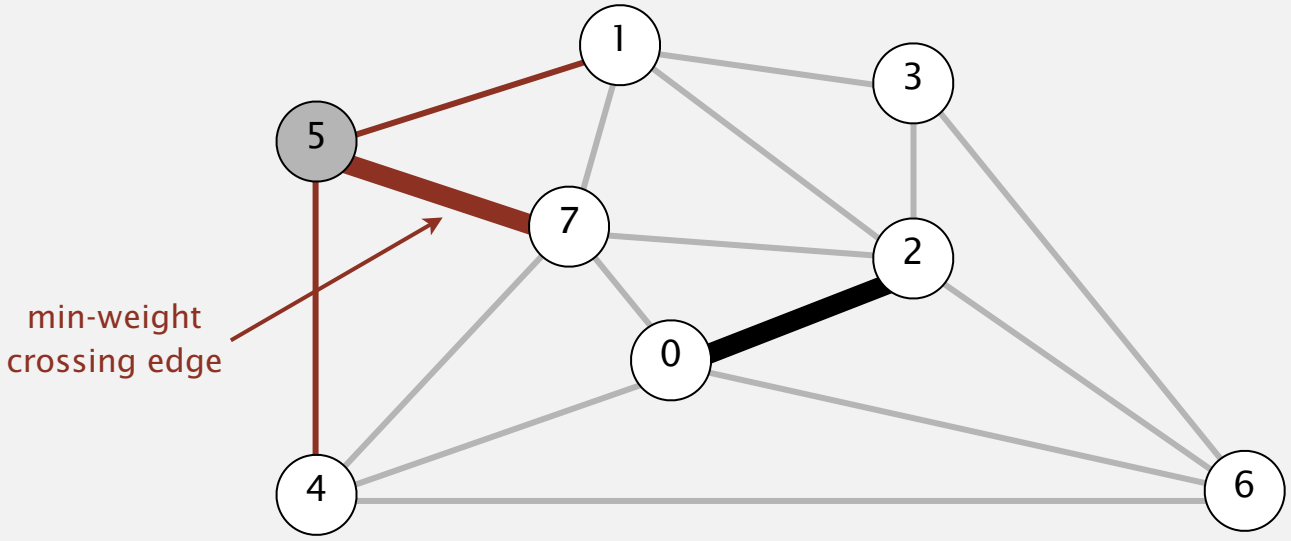


crossing edges
(sorted by weight)

| | | |
|---|---|---|
| in MST → | 5-7 | 0.28 |
| | 1-5 | 0.32 |
| | 4-5 | 0.35 |

**MST edges**

0-2

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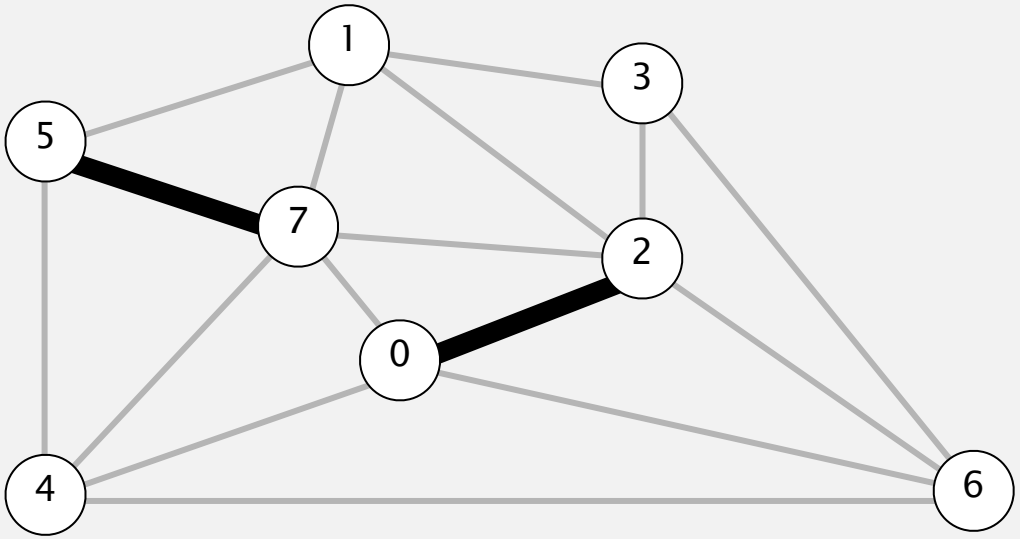


**MST edges**

0-2 5-7

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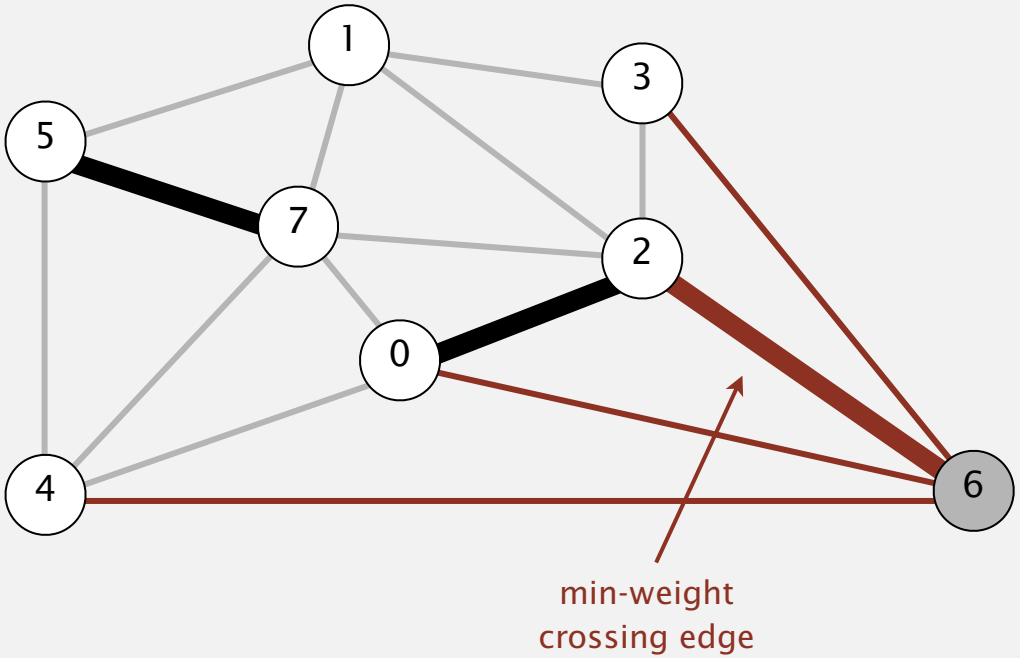


crossing edges
(sorted by weight)

| | | |
|---|---|---|
| in MST → | 6-2 | 0.40 |
| | 3-6 | 0.52 |
| | 6-0 | 0.58 |
| | 6-4 | 0.93 |

**MST edges**

0-2 5-7

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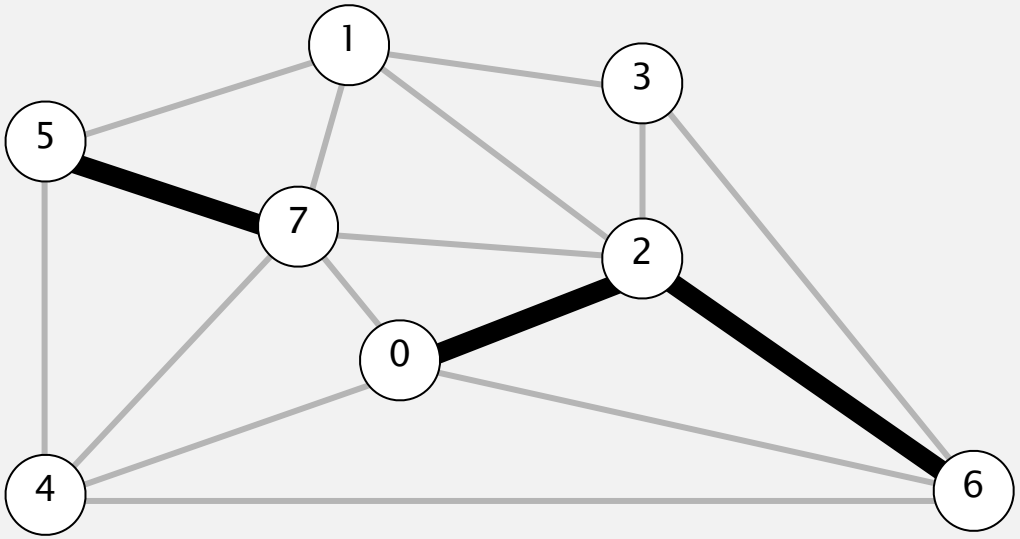


**MST edges**

0-2 5-7 6-2

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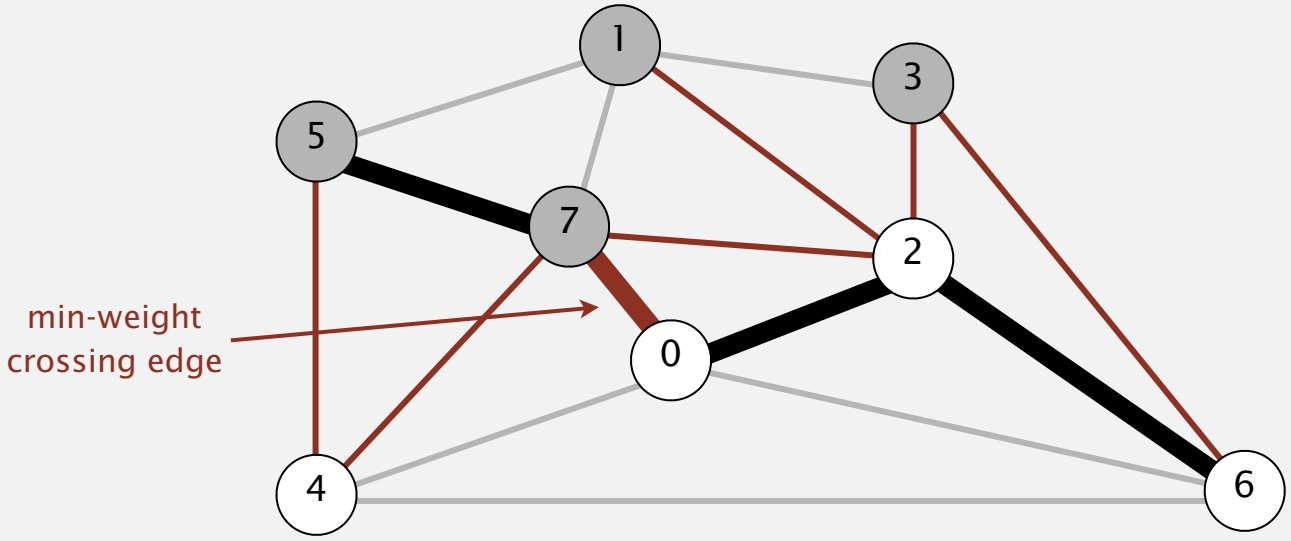


crossing edges
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| | | |
|---|---|---|
| in MST → | 0-7 | 0.16 |
| | 2-3 | 0.17 |
| | 2-7 | 0.34 |
| | 4-5 | 0.35 |
| | 1-2 | 0.36 |
| | 4-7 | 0.37 |
| | 3-6 | 0.52 |

**MST edges**

0-2 5-7 6-2

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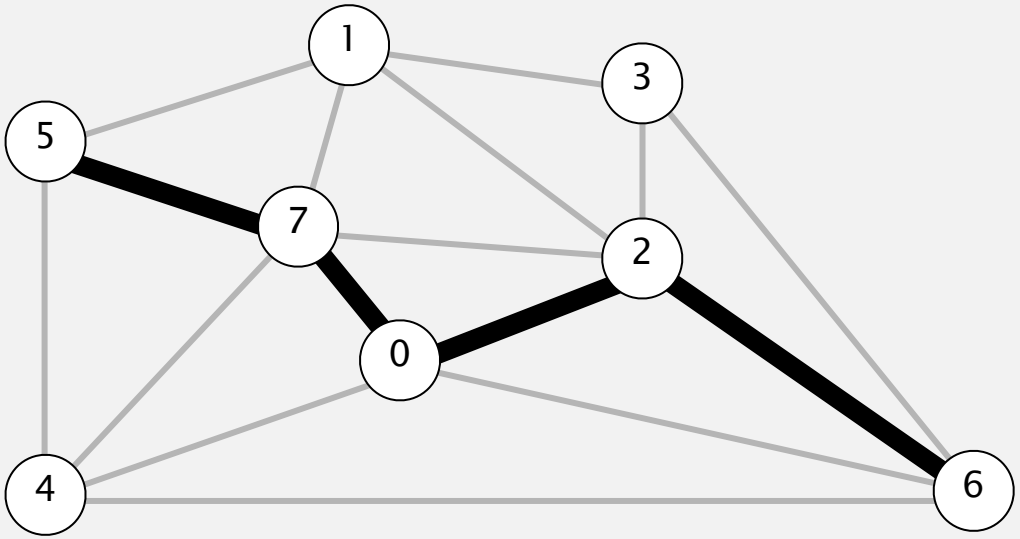


**MST edges**

0-2 5-7 6-2 0-7

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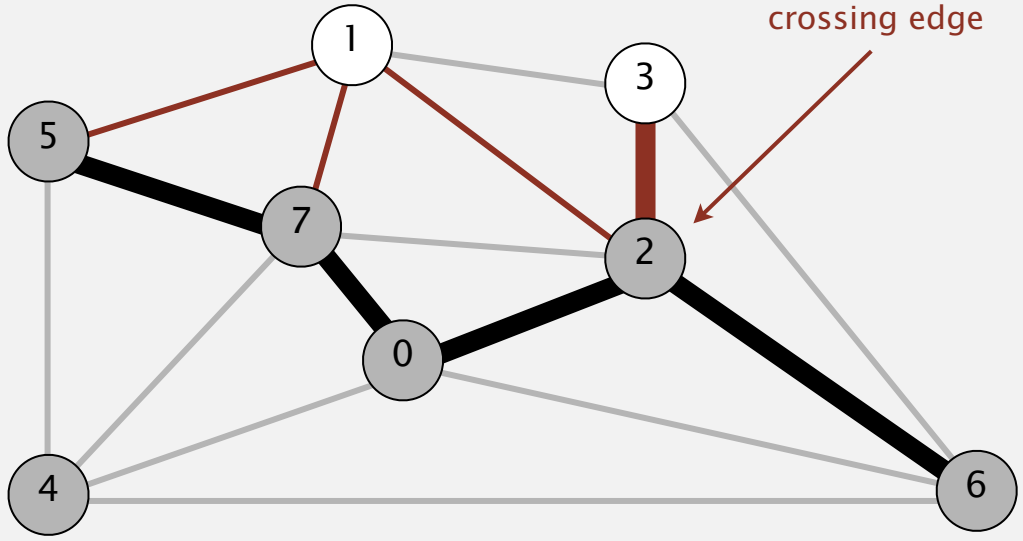


crossing edges
(sorted by weight)

| | | |
|---|---|---|
| in MST → | 2-3 | 0.17 |
| | 1-7 | 0.19 |
| | 1-5 | 0.32 |
| | 1-2 | 0.36 |

**MST edges**

0-2 5-7 6-2 0-7

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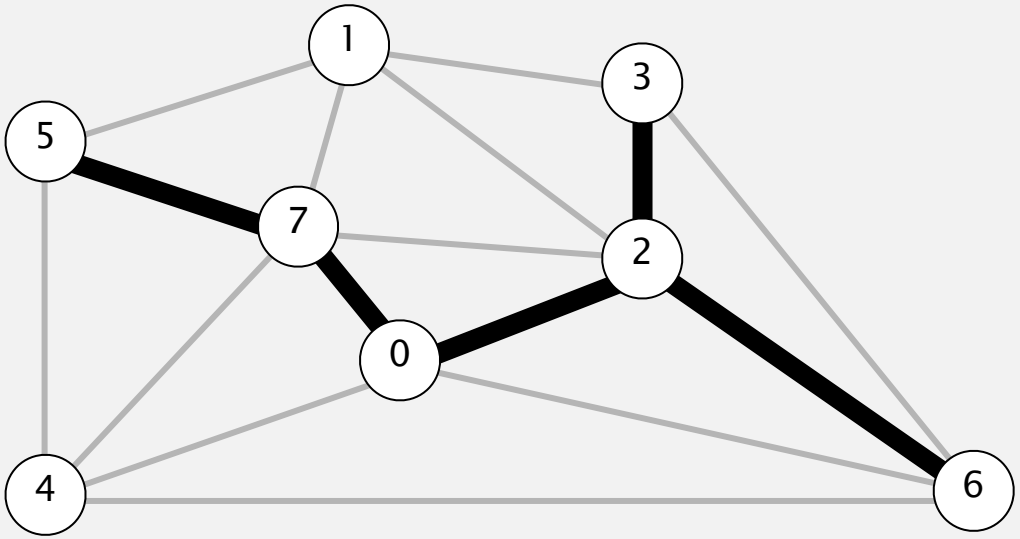


**MST edges**

0-2 5-7 6-2 0-7 2-3

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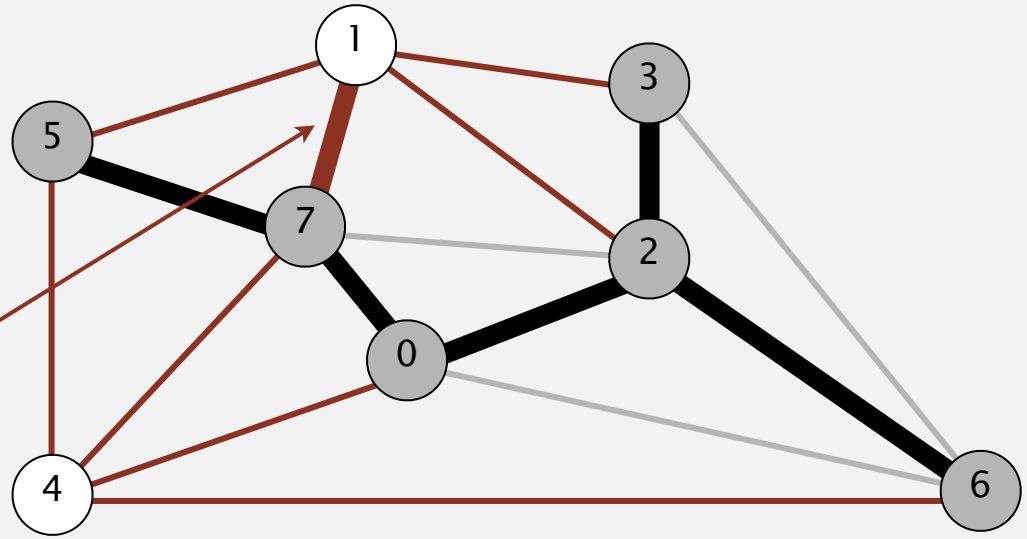


min-weight crossing edge

crossing edges (sorted by weight)

in MST →

| | |
|---|---|
| 1-7 | 0.19 |
| 1-3 | 0.29 |
| 1-5 | 0.32 |
| 4-5 | 0.35 |
| 1-2 | 0.36 |
| 4-7 | 0.37 |
| 0-4 | 0.38 |
| 6-4 | 0.93 |

**MST edges**

0-2 5-7 6-2 0-7 2-3

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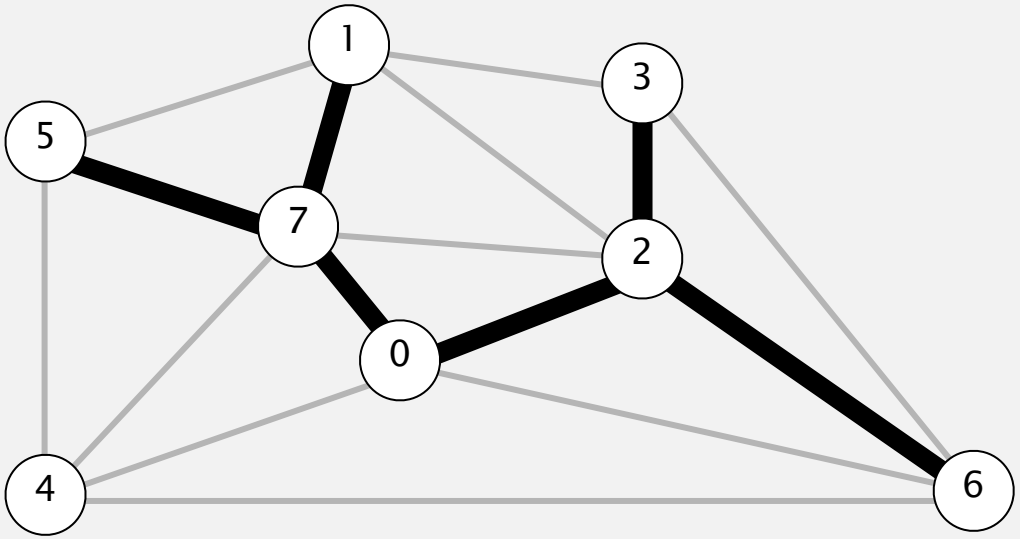


**MST edges**

0-2 5-7 6-2 0-7 2-3 1-7

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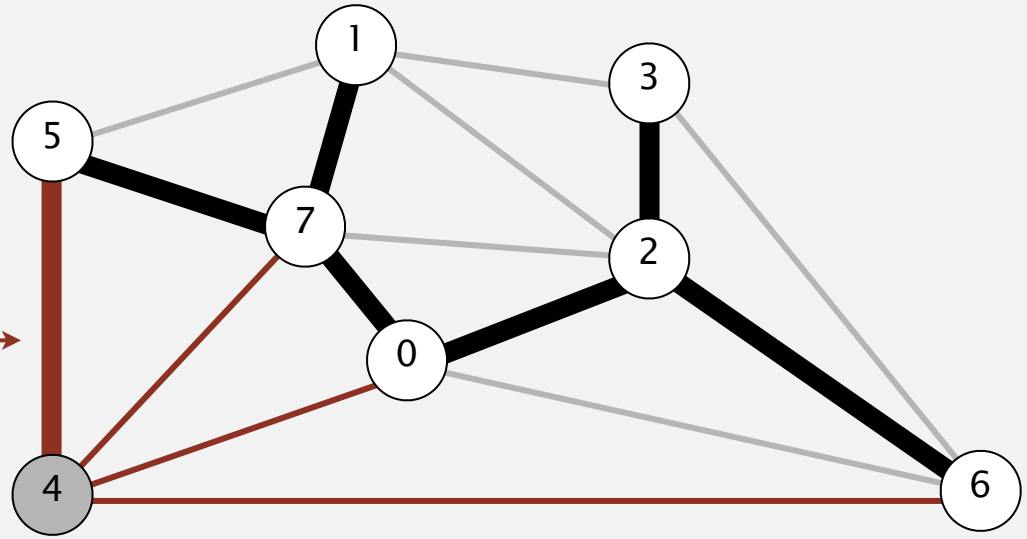


min-weight crossing edge →

crossing edges (sorted by weight)

| | | |
|---|---|---|
| in MST → | 4-5 | 0.35 |
| | 4-7 | 0.37 |
| | 0-4 | 0.38 |
| | 6-4 | 0.93 |

**MST edges**

0-2 5-7 6-2 0-7 2-3 1-7

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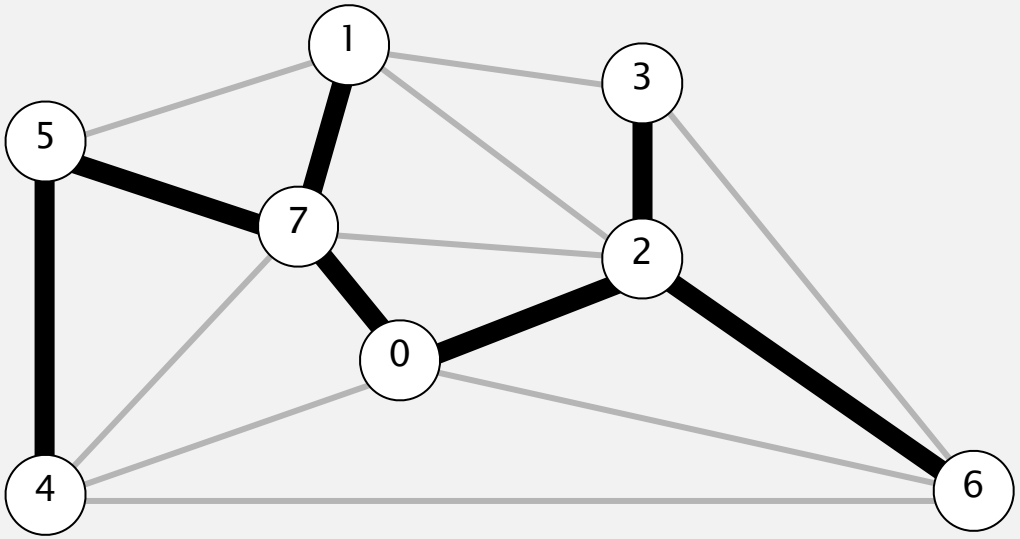


**MST edges**

0-2 5-7 6-2 0-7 2-3 1-7 4-5