# Grafen
## Definities
## Breadth First Search Algoritme

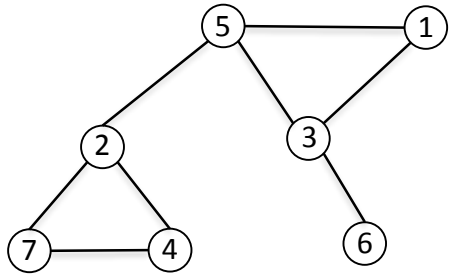
Lesweek 8

Samenvatting van (een gedeelte van) de cursusnota's

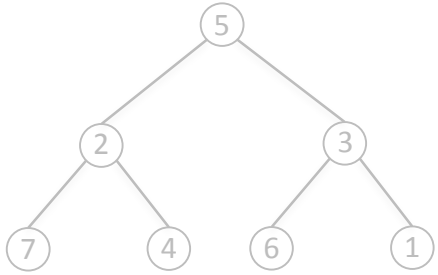
# Datastructuren

- **Lineair**: de elementen vormen een rij.

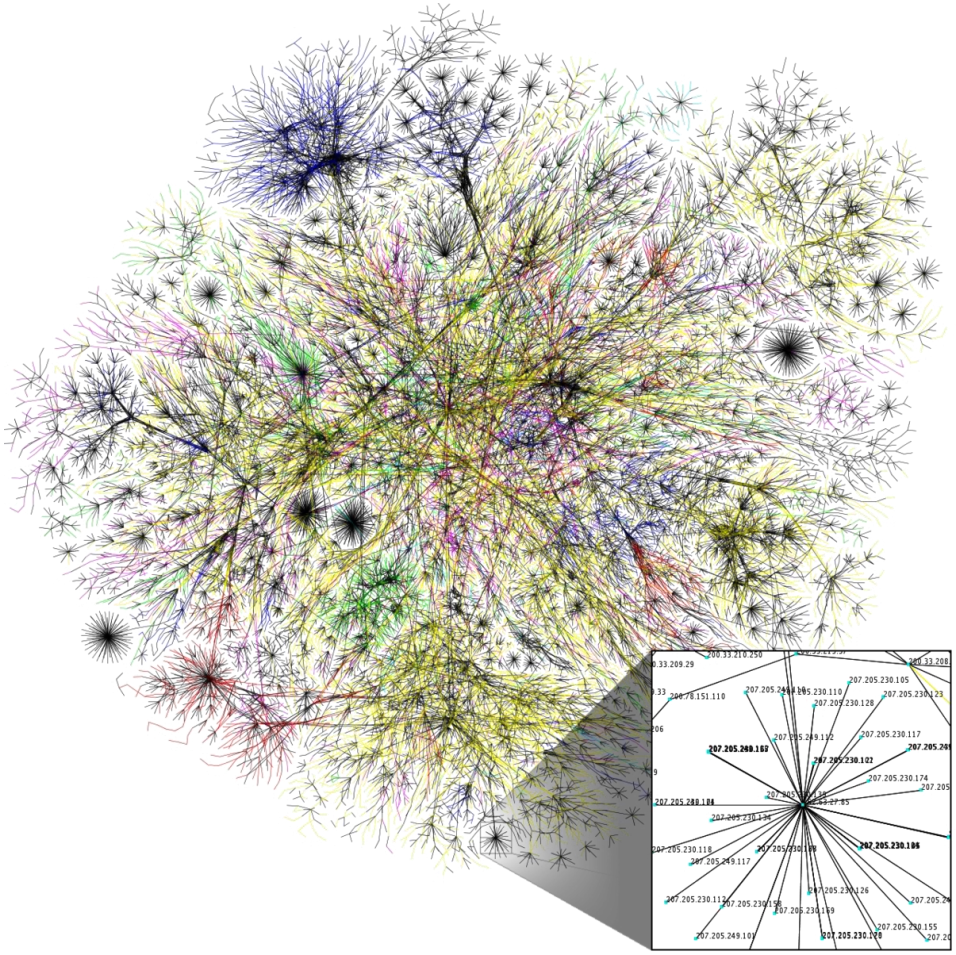

- **Niet-lineair**: de elementen vormen geen rij.
  - **Graaf**: lussen zijn toegelaten.




  - **Boom**: lussen zijn niet toegelaten.



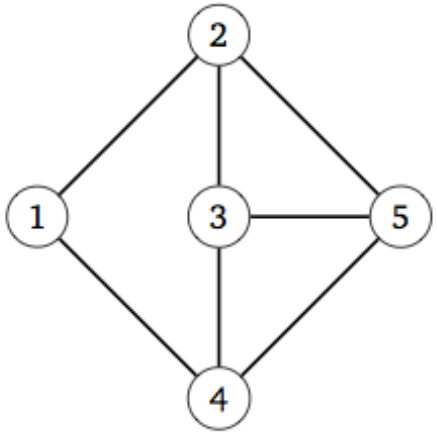
# Definitie



Graaf = verzameling knooppunten die met mekaar verbonden zijn

# Definities

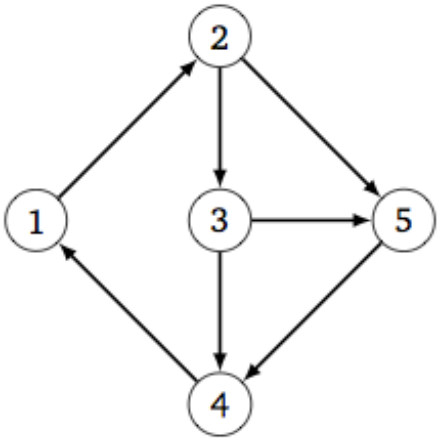
**niet-gerichte graaf**




$$N = \{1, 2, 3, 4, 5\}$$

$$A = \{\{1,2\}, \{1,4\}, \{2,3\}, \{2,5\}, \{3,4\}, \{3,5\}, \{4,5\}\}$$

**gerichte graaf**

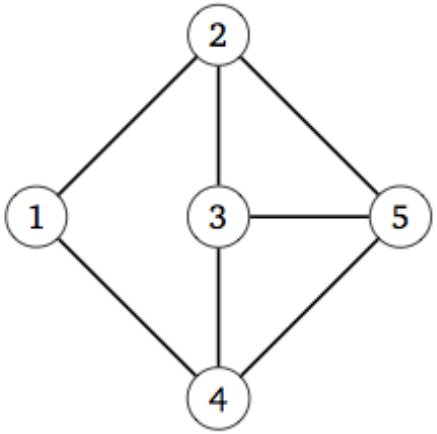



$$N = \{1, 2, 3, 4, 5\}$$

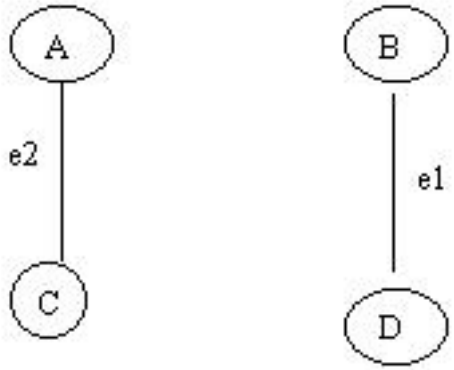
$$A = \{(1,2), (4,1), (2,3), (2,5), (3,4), (3,5), (5,4)\}$$

# Definities

- gemengde graaf
- pad opeenvolging van knooppunten (verbonden met tak)
- samenhangend pad tussen elke twee knooppunten



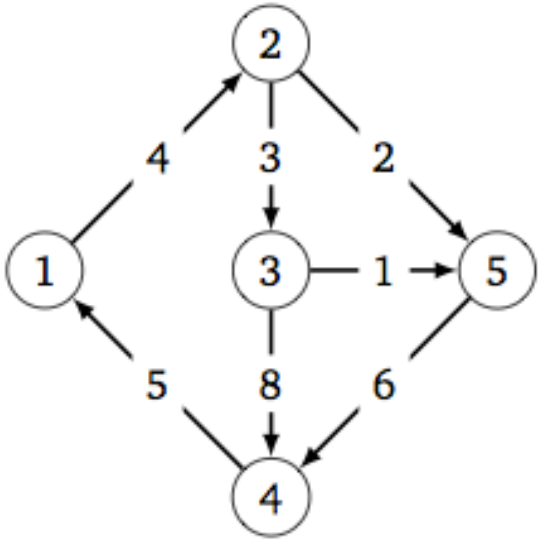

samenhangend



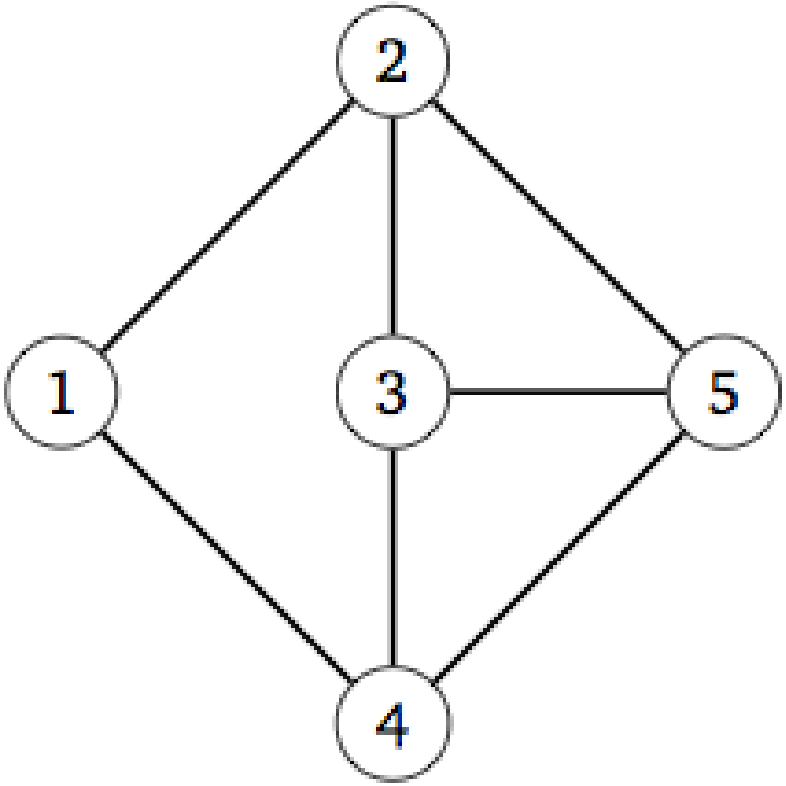

Niet samenhangend

# Definities

netwerk (gewogen) graaf

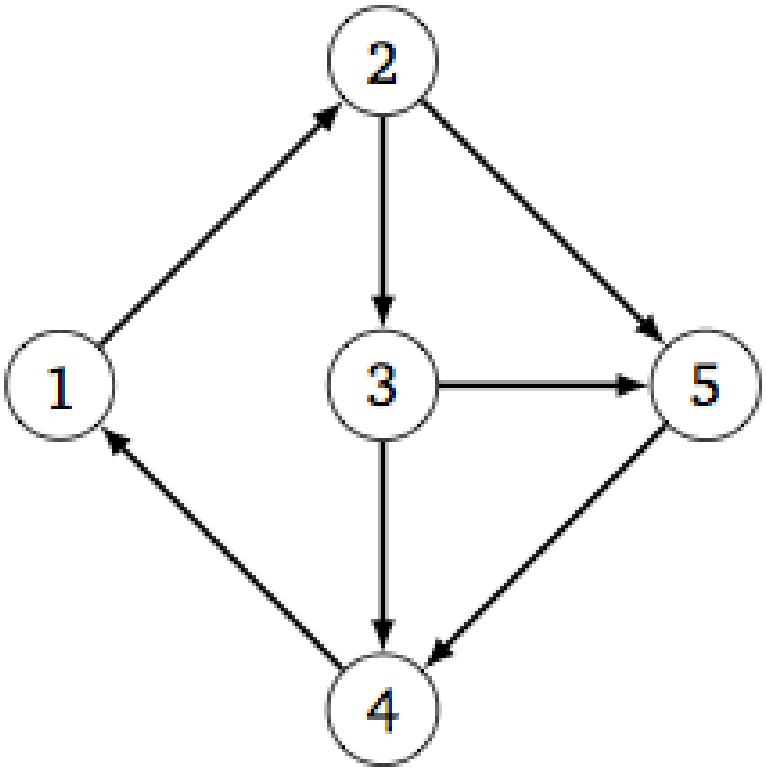


# Verbindingsmatrix




| | | naar | | | | |
|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 |
| van | 1 | 0 | 1 | 0 | 1 | 0 |
| | 2 | 1 | 0 | 1 | 0 | 1 |
| | 3 | 0 | 1 | 0 | 1 | 1 |
| | 4 | 1 | 0 | 1 | 0 | 1 |
| | 5 | 0 | 1 | 1 | 1 | 0 |

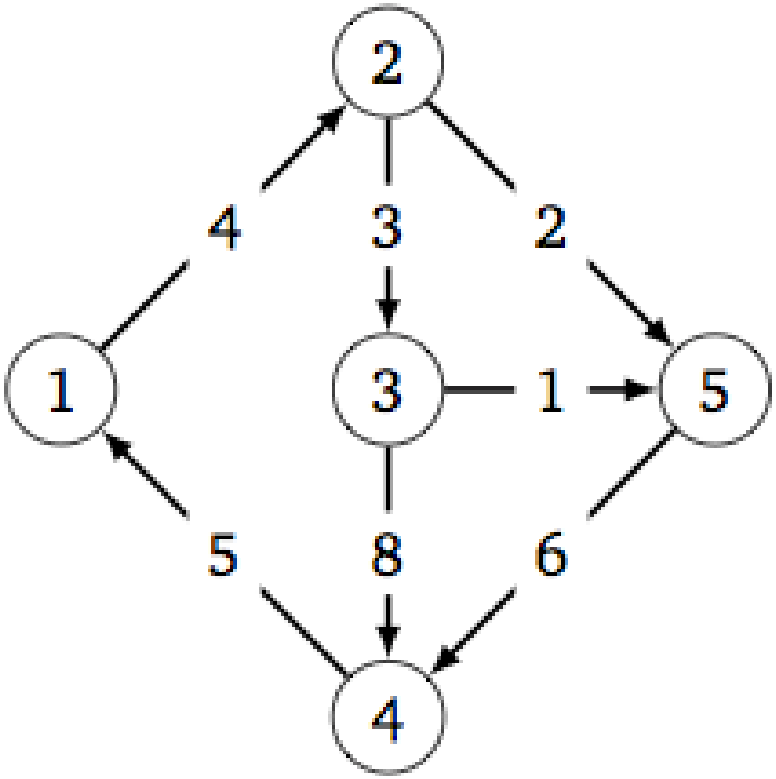
# Verbindingsmatrix




| | | naar | | | | |
|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 |
| van | 1 | 0 | 1 | 0 | 0 | 0 |
| | 2 | 0 | 0 | 1 | 0 | 1 |
| | 3 | 0 | 0 | 0 | 1 | 1 |
| | 4 | 1 | 0 | 0 | 0 | 0 |
| | 5 | 0 | 0 | 0 | 1 | 0 |

Gebruik: aantal paden tellen van gegeven lengte tussen twee knooppunten

# Gewichtenmatrix




naar

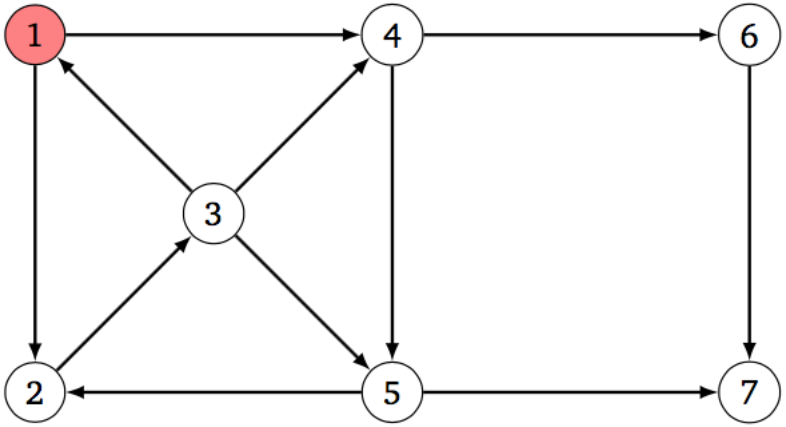
| | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| 1 | 0 | 4 | ∞ | ∞ | ∞ |
| 2 | ∞ | 0 | 3 | ∞ | 2 |
| 3 | ∞ | ∞ | 0 | 8 | 1 |
| 4 | 5 | ∞ | ∞ | 0 | ∞ |
| 5 | ∞ | ∞ | ∞ | 6 | 0 |

# Toepassing: Breadth First Search

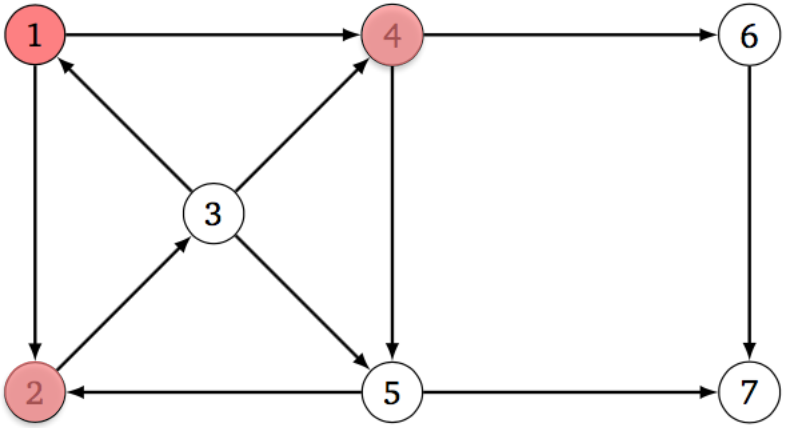
- Gegeven twee knooppunten. Vind het pad met het kleinst aantal tussenliggende knooppunten (‘kortste pad’).
- Reconstrueer het pad

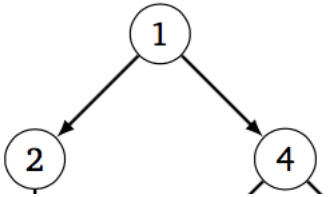
- Zoek in breedte: voeg knooppunten toe die rechtstreeks verbonden zijn met gegeven knooppunt

BFS  van knoop 1 naar knoop 7

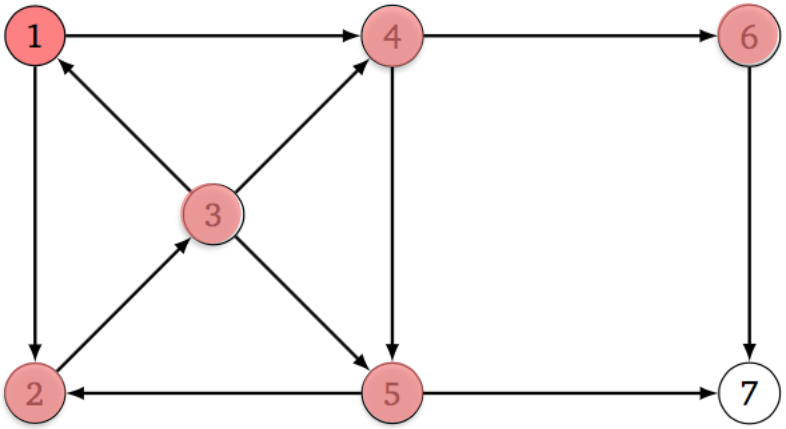


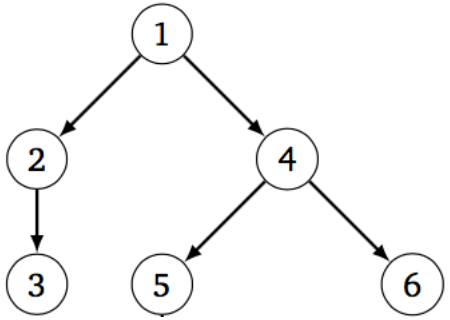

BFS  van knoop 1 naar knoop 7



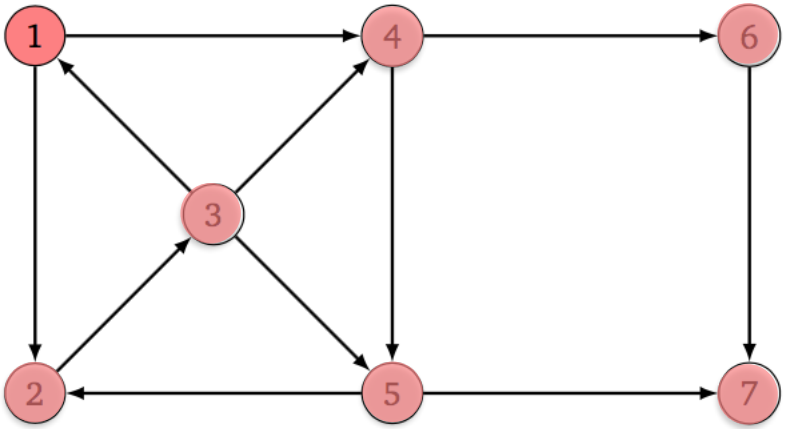



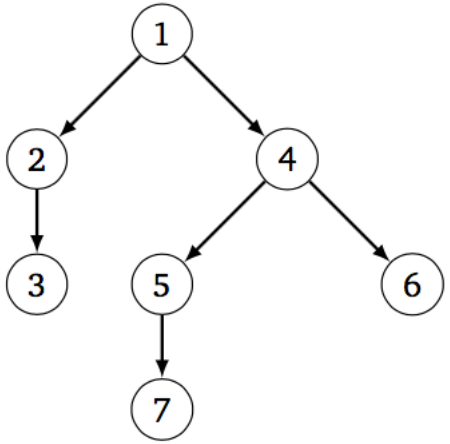
BFS  van knoop 1 naar knoop 7



BFS  van knoop 1 naar knoop 7




BFS van knoop 1 naar knoop 7 : 1 → 4 → 5 → 7