

Graphs and Networks

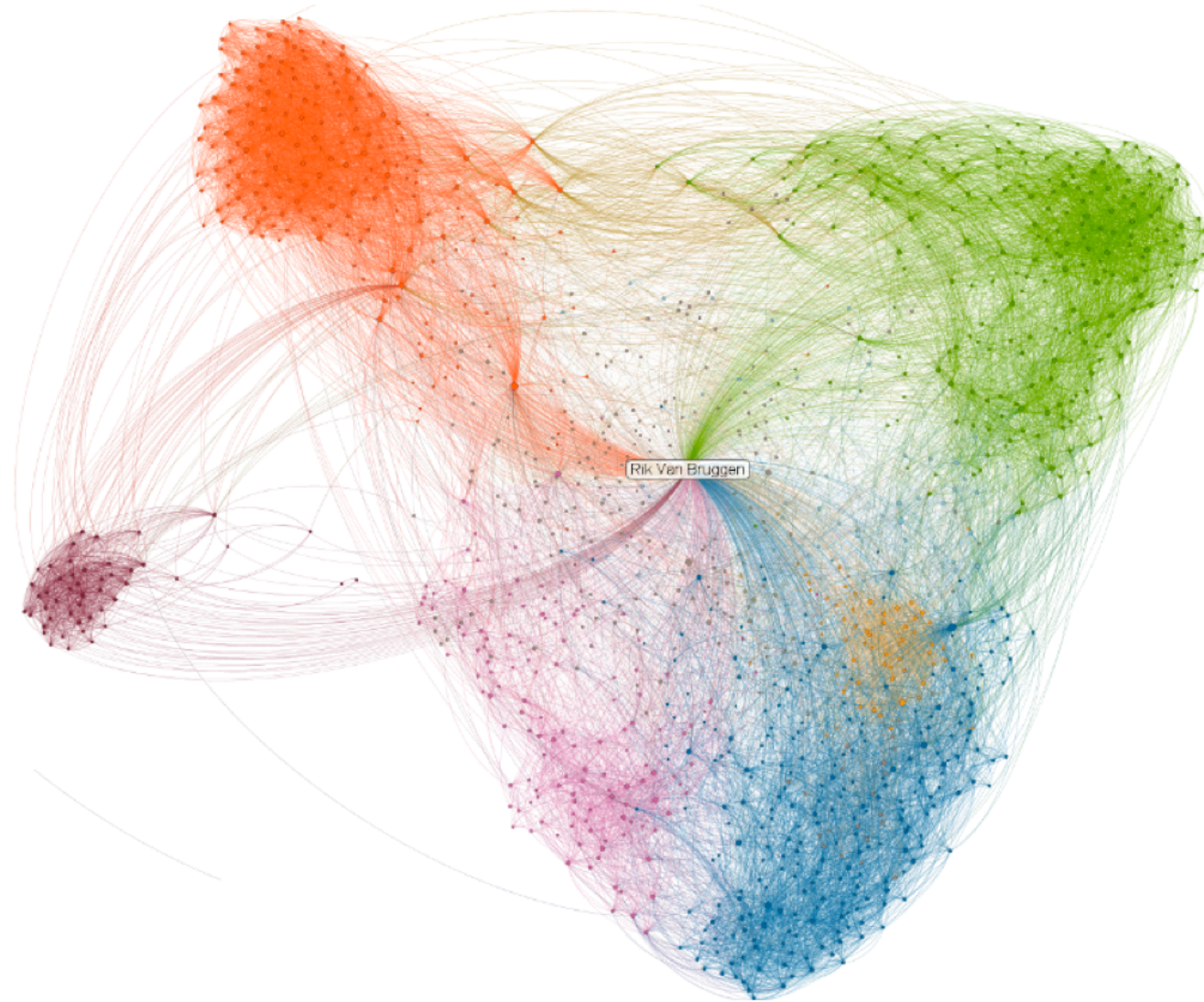
DS2000: Intro to Programming with Data



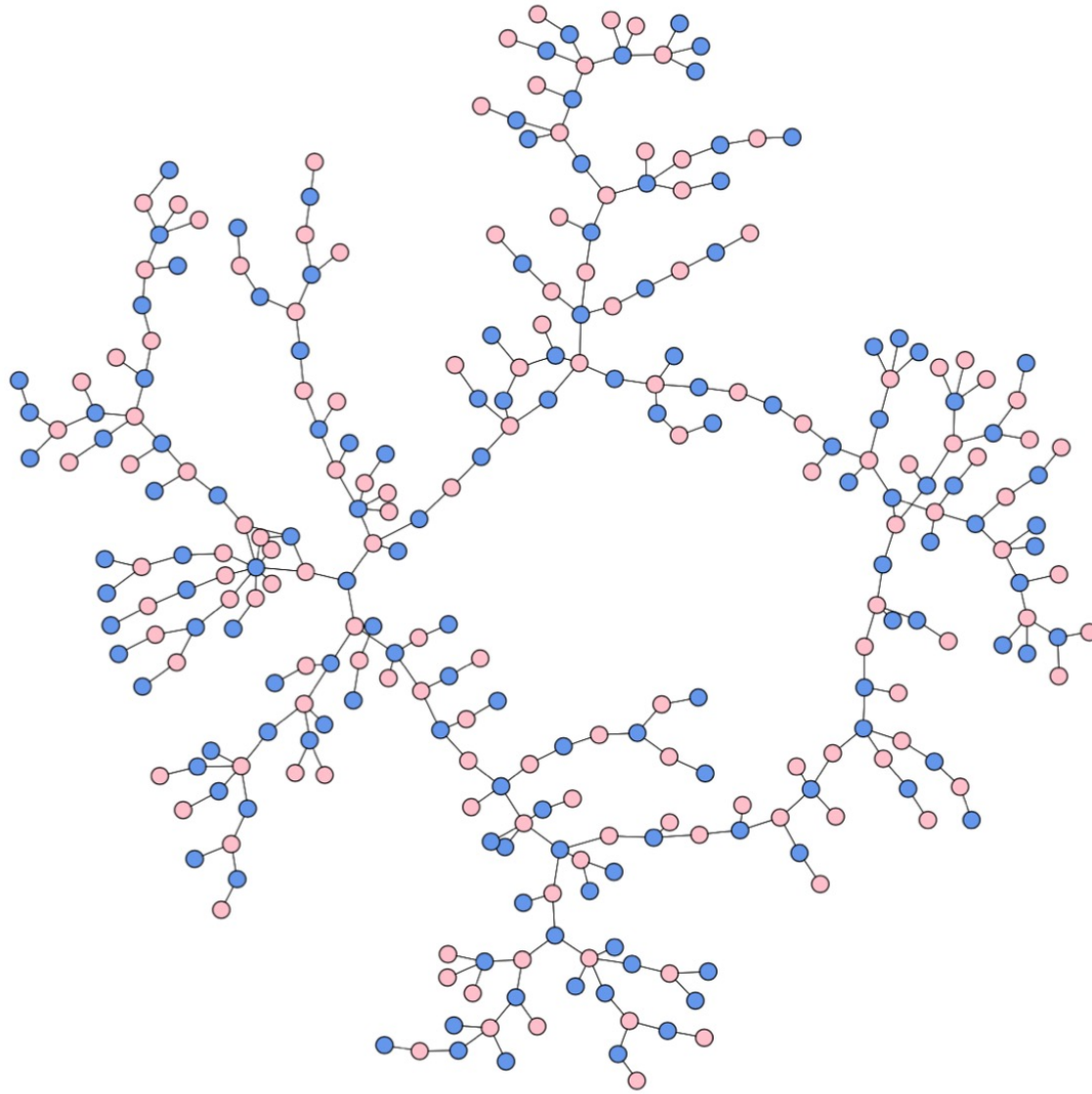
Northeastern University

John Rachlin
Northeastern University

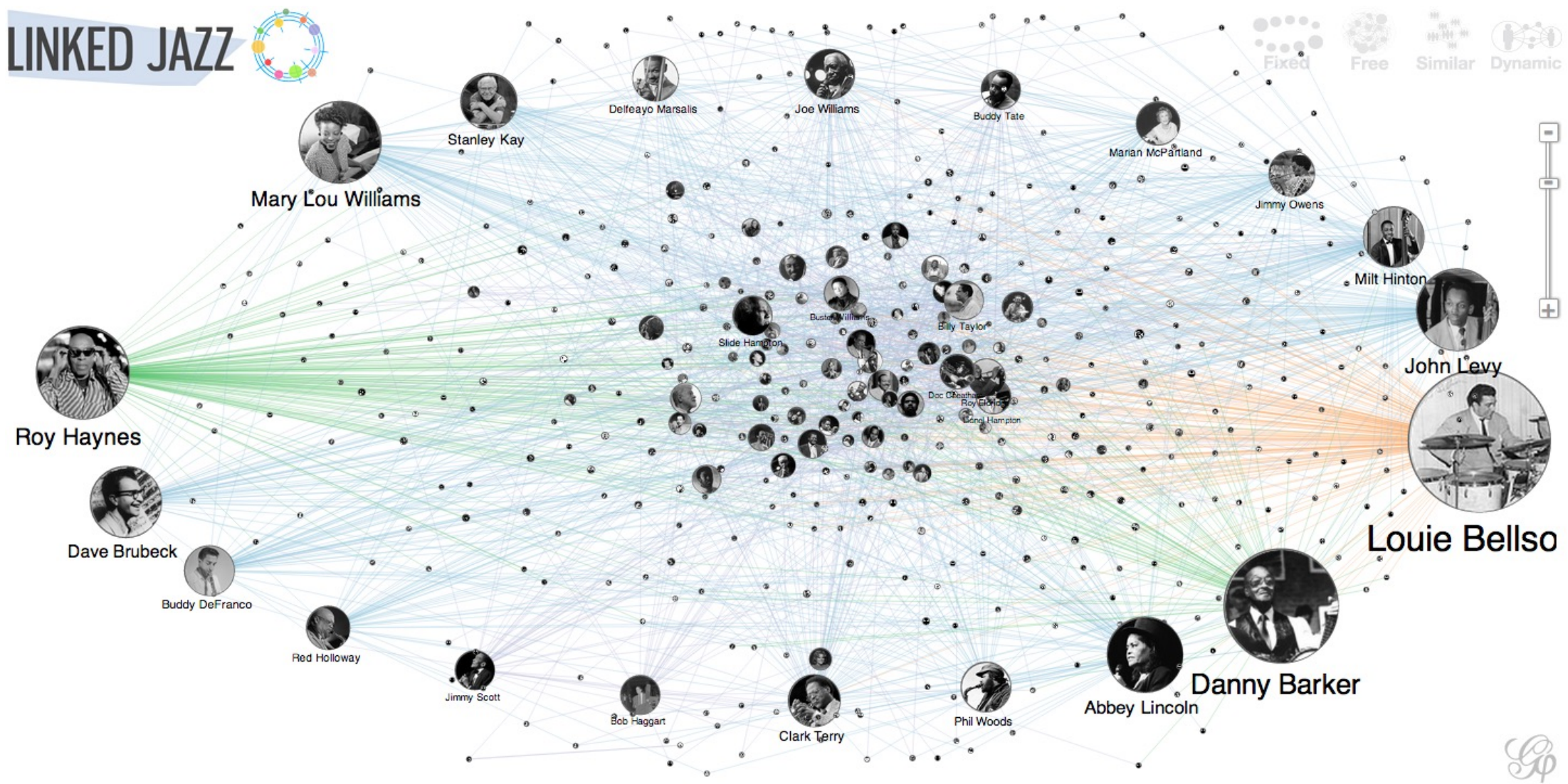
Graphs are Ubiquitous...in society



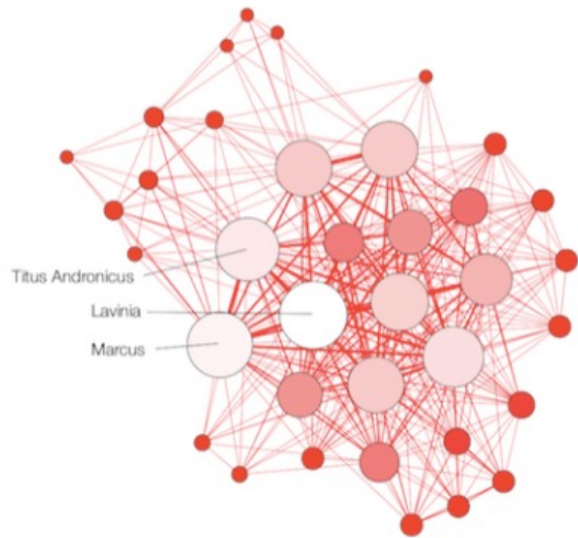
Dating Networks in High School



Graphs are Ubiquitous...in music



Graphs are Ubiquitous...in literature



TITUS ANDRONICUS

Number of characters 36 | 50% Network density



ROMEO AND JULIET

Number of characters 41 | 37% Network density



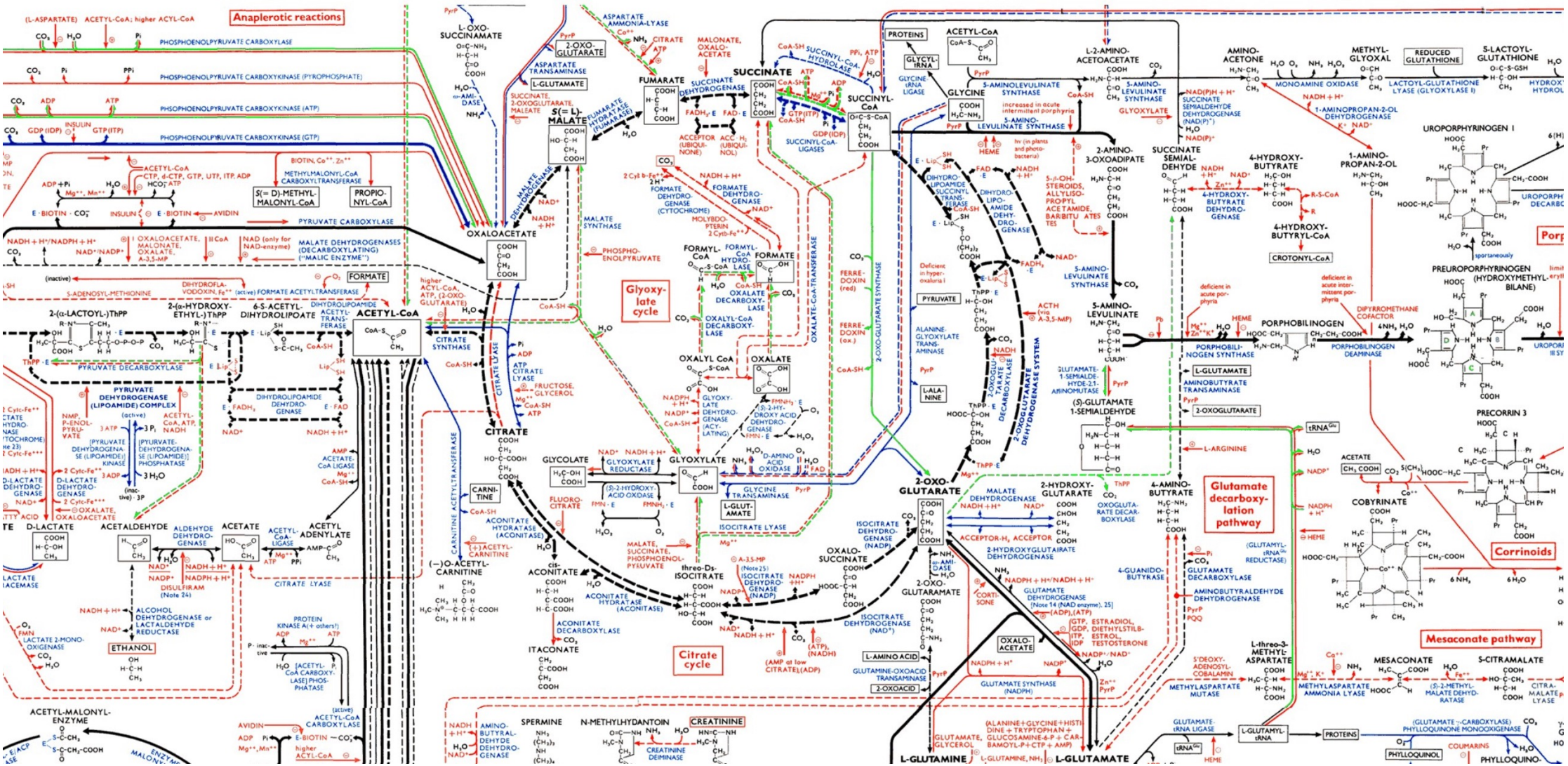
JULIUS CAESAR

Number of characters 46 | 34% Network density

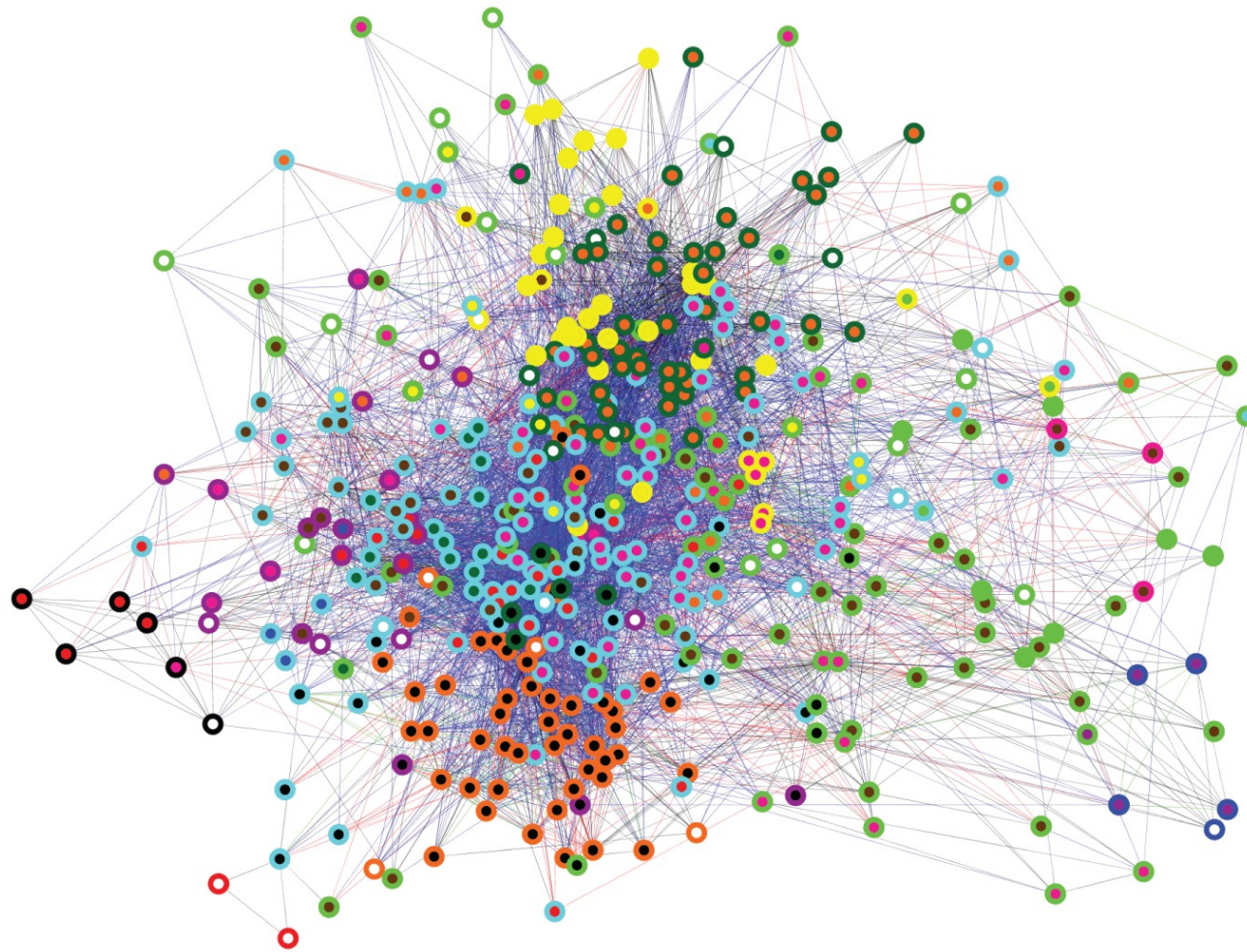
From: www.martingrandjean.ch/network-visualization-shakespeare



Graphs are Ubiquitous...In Biology



Graphs are Ubiquitous...In Biology



| | Pure | Complete |
|-------------------------------|-------|----------|
| Parasitic diseases | 0.750 | 0.750 |
| Nervous system neoplasms | 1.000 | 0.833 |
| Muscle and ligament disorders | 0.556 | 1.000 |
| Conduct disorder | 0.667 | 1.000 |
| Communication impairment | 0.593 | 1.000 |
| Sensation disorders | 0.593 | 1.000 |
| Malignant neoplasms | 0.956 | 0.717 |
| Neoplasms | 0.733 | 0.155 |
| Endocrine gland neoplasms | 0.267 | 0.667 |
| Dis. of hematopoietic system | 0.667 | 0.375 |
| Heart diseases | 1.000 | 0.778 |
| Disease of metabolism | 0.455 | 0.128 |
| "Brain diseases, metabolic" | 0.182 | 1.000 |
| Disease of metabolism | 0.489 | 0.590 |
| Endocrine pancreas disorders | 0.149 | 1.000 |
| Cardiovascular disease | 0.652 | 0.366 |
| Vascular diseases | 0.478 | 0.611 |
| Bacterial infections | 0.600 | 0.429 |
| Behavioral disease | 0.500 | 0.129 |
| Mental retardation | 0.375 | 1.000 |
| Psychotic disorders | 0.125 | 0.111 |
| Digestive system disorders | 0.412 | 0.160 |
| Endocrine system disease | 0.353 | 0.150 |
| Infectious diseases | 0.875 | 0.412 |
| Congenital abnormality | 0.300 | 0.600 |
| Head disease | 0.275 | 0.917 |
| Digestive system disorders | 0.275 | 0.250 |

From: Davis and Chawla (2011) Exploring and Exploting Interactions from Multi-Relational Gene and Phenotypic Networks

