

# Machine Learning

## Images

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# Images

## Signal processing

in 2 or 3 dimensions

# Images

Details that can matter:

- Illumination
- White balance
- Resolution
- Camera settings (e.g., depth of field)
- Sensor noise
- Compression technology

# Images

## Challenges:

- Segmentation
- Area of interest detection
- Perspective shifting

# Images

## Applications:

- Agriculture: fruit ripening, automated harvesting
- Security: detecting specific people
- Security: detecting accidents (e.g., falls)
- Art: counterfeit detection
- Medicine: assisted surgery
- Image search

# Images

Image search (at first):

- Texture
- Colour
- Shape, simple objects



*Eddie Bell @ Lyst*



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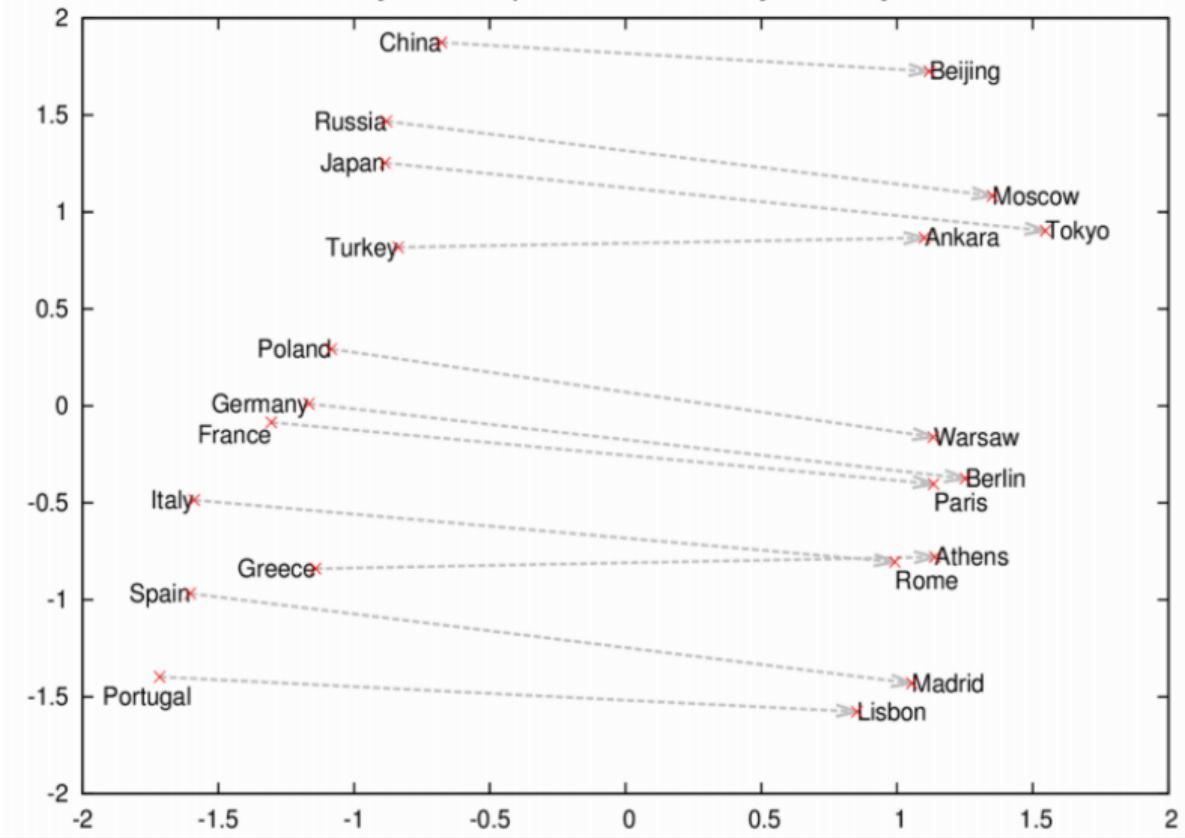
-1	0	+1
-2	0	+2
-1	0	+1



-1	-2	-1
0	0	0
+1	+2	+1



### Country and Capital Vectors Projected by PCA



Term	Similarity	
	"shift"	0.933104
	"gown"	0.887743
	"skirt"	0.881672
	"bandage"	0.880162
	"midi"	0.869786

**Similar to 'dress'**



a group of young girls standing next  
to each other on the beach



A clock tower with a clock on top of it

*Google?*



## A bunch of bananas hanging from a tree

*Google?*

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**TITUS ANDRONICUS**  
Number of **36** | 50% Network density



**ROMEO AND JULIET**  
Number of **41** | 37% Network density



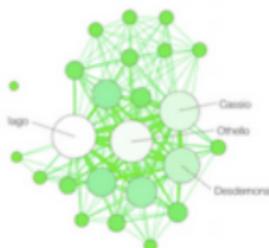
**JULIUS CAESAR**  
Number of **46** | 34% Network density



**HAMLET**  
Number of **37** | 39% Network density

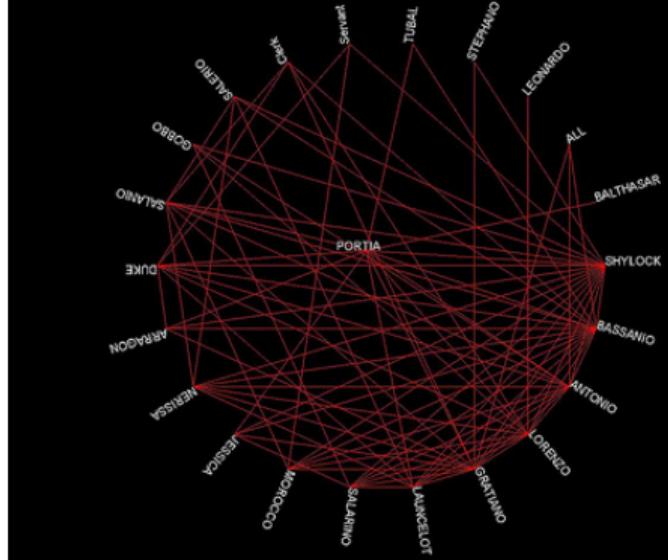


**TROILUS AND CRESSIDA**  
Number of **35** | 40% Network density



**OTHELLO**  
Number of **24** | 55% Network density

Merchant of Venice : diagram showing who speaks to who (most connected in the middle)  
Public Domain - <http://www.pgogy.com/bill/>



Friar Laurence: *No remedy.*  
 Friar: And I am nothing else to start his horse.  
 Friar Laurence: *Unknown is the course; I like it not.*

**And therefore have I little talked of love.**

Friar Laurence: *Look, sir, here comes the lady towards my cell.*

Friar: *Pardon me, my lady and my wife.*  
**How now, my love, where comest thou?**  
 Friar: *From my round bower, where am I come from.*  
**What counsel hast thou?**  
 Friar Laurence: *That's a secret too.*

Friar: *Come to make confession to the father.*  
**To a secret that I should confess to you,**  
 Friar: *Be not sorry to hear that you have me.*  
**And confesse to you your thoughts,**  
 Friar: *For all I have done, that you have seen.*  
**Being square behind your back, stand to your fate.**  
 Friar: *For such thy back is crooked shouldst thou have.*  
**The tears have got small victory by that;**  
 Friar: *How angry is man that sees all that again.*  
**And what I say, I say it to thy face.**  
 Friar: *Thy face is angry, and thou hast deserved it.*  
**Or shall I come to you at evening mass.**  
 Friar Laurence: *My leisure serves me, gentle daughter, now.*  
 Friar: *Juliet, on Thursday early will I rouse ye.*  
**Put hope, put courage, put help,**  
 Friar Laurence: *I hear thou must, and nothing may prorogue it.*

**Tell me not, friar, that thou  
hear'st of this.**

Friar Laurence: *Thou hast the strength of will to slay thyself.*

**My dreams presage some joyful news at hand.**

Romeo: *Her body sleeps in Capels' monument.*

**I will hence to-night.**  
 Romeo: *I do beseech you, sir, have patience.*  
**Tush, thou art deceived.**  
 Romeo: *No import he.*  
**get thee gone.**

Romeo: *Who calls me foul?*  
**That the life-weary taker may fall dead.**

Romeo: *But Montague's too狠*  
**famine is in thy cheeks.**  
 Romeo: *No answer but can kill us both.*  
**Thy bosom swells with my soft self.**  
 Romeo: *Put this in any liquid thing you will.*  
**There is thy gold, worse poison to men's souls.**

questions?