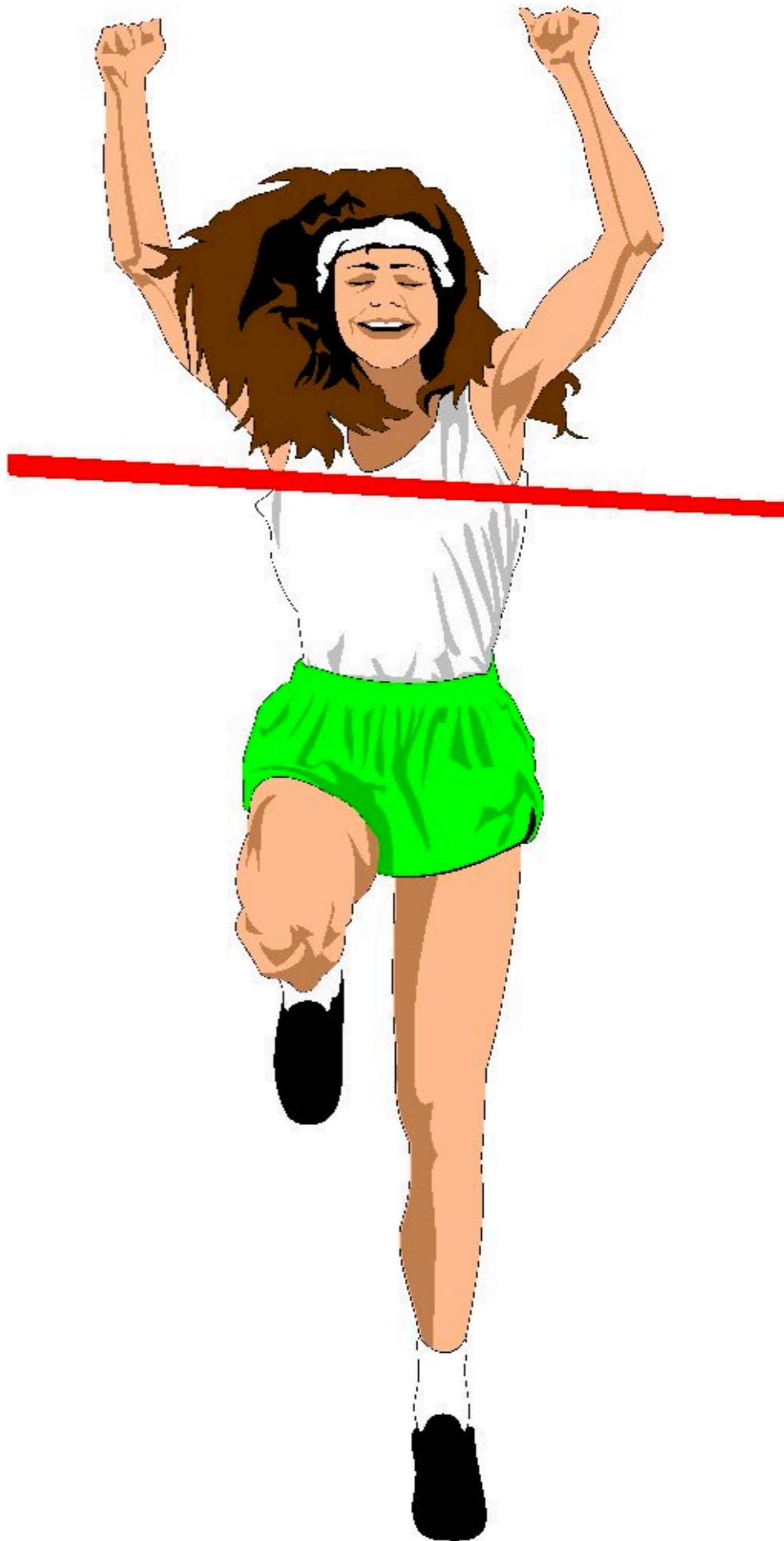


LINEAR REGRESSION IV

11.26.2018

HOMEWORK 4

* Due TODAY!



RECAP

- * linear regression
 - * find the weights (beta) that minimize the squared error

RECAP

- * linear regression can be “poorly conditioned”
 - * this happens when you have regressors that are very similar
 - * or when you have lots of regressors
 - * (in both cases it means that your regressors are “linearly dependent”)

RECAP

- * the problem is that there are many different sets of weights that would give ~the same answer
- * the solution: a “prior” on the weights, where you say that certain sets of weights are just *better* than others
- * for example, sets of weights that are “smaller”
- * this is called “regularization”

RECAP: REGULARIZATION

- * with regularization the error is the sum of a **loss term** and a **penalty term**

$$Err(\beta) = \sum_{t=1}^T (y_t - x_t \beta)^2 + \lambda \sum_{i=1}^P \beta_i^2$$

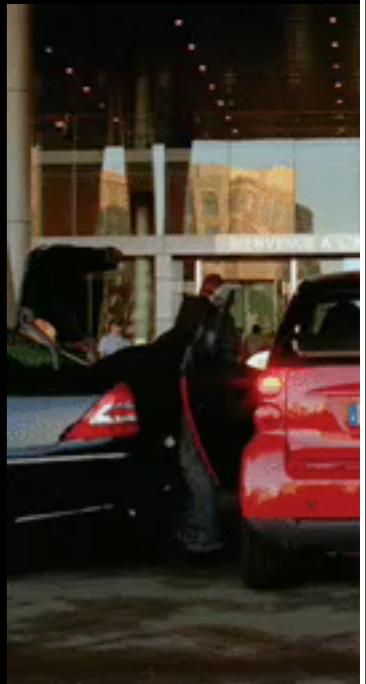
RECAP: REGULARIZATION

- * it also introduces an extra parameter, λ , which is the *regularization coefficient*, or, in this case, *ridge coefficient*

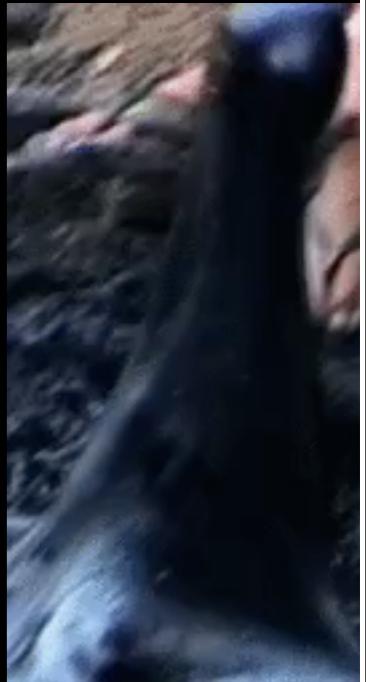
$$Err(\beta) = \sum_{t=1}^T (y_t - x_t \beta)^2 + \lambda \sum_{i=1}^P \beta_i^2$$

RIDGE REGRESSION IN PRACTICE

Natural Movie Experiment



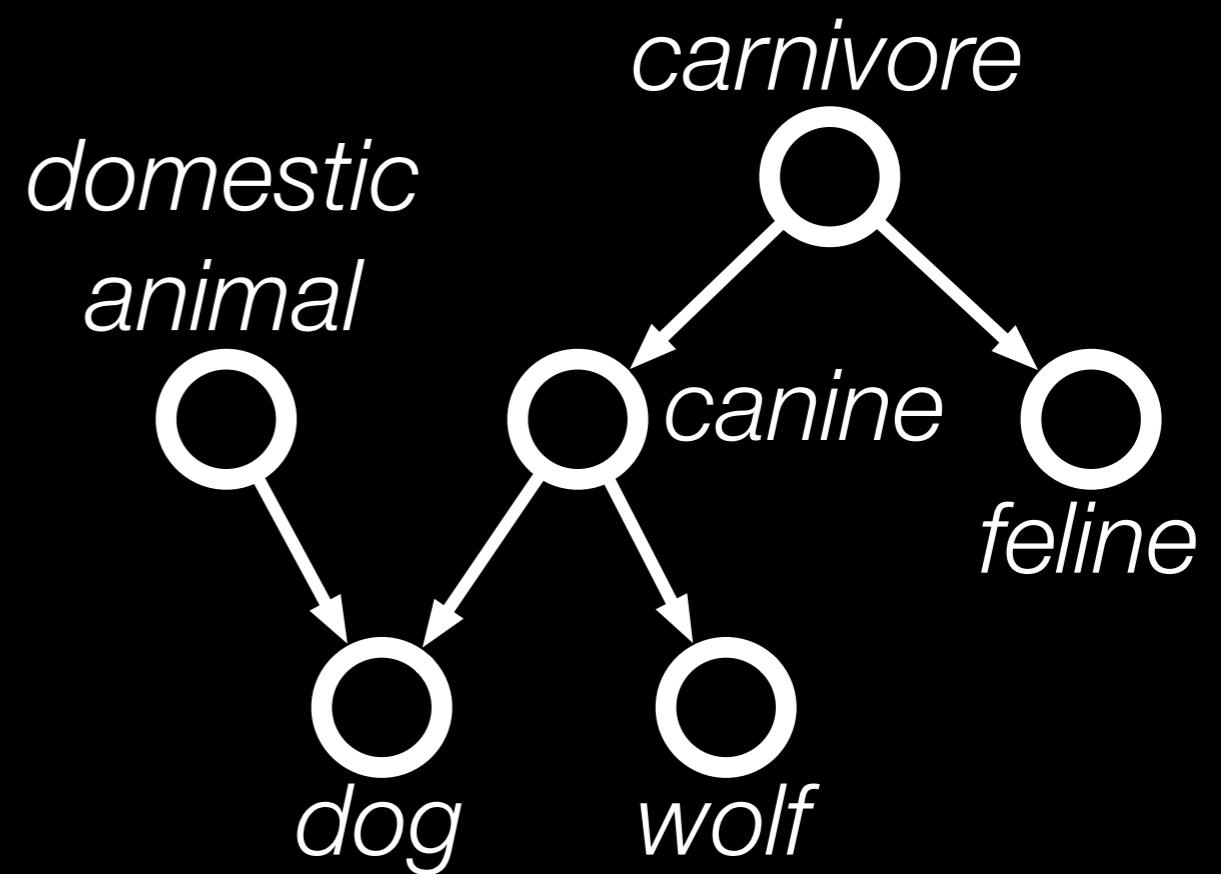
horse
man
horse
walk
road
spectator
mountain



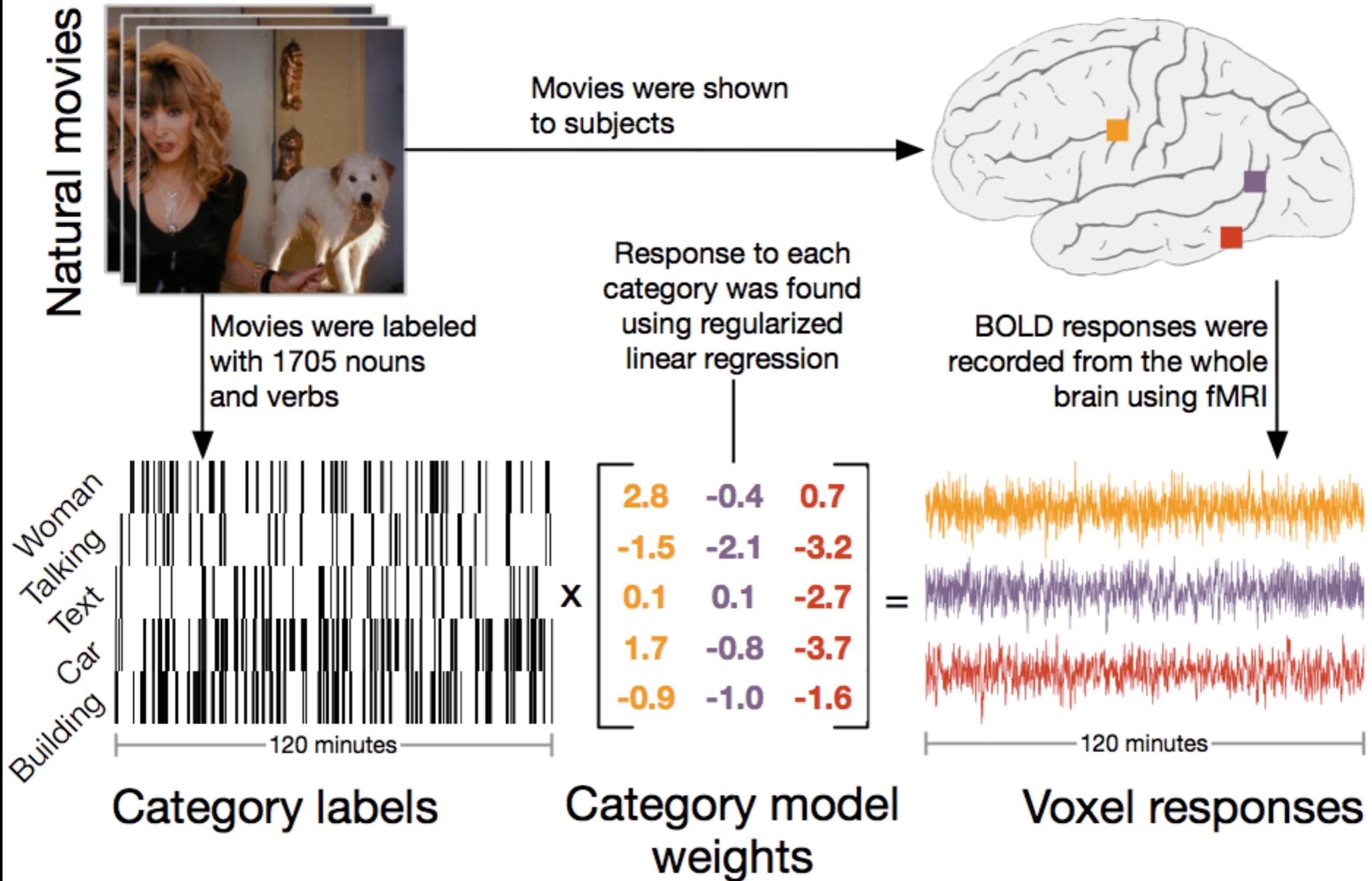
Semantic Model: WordNet

Stimulus matrix

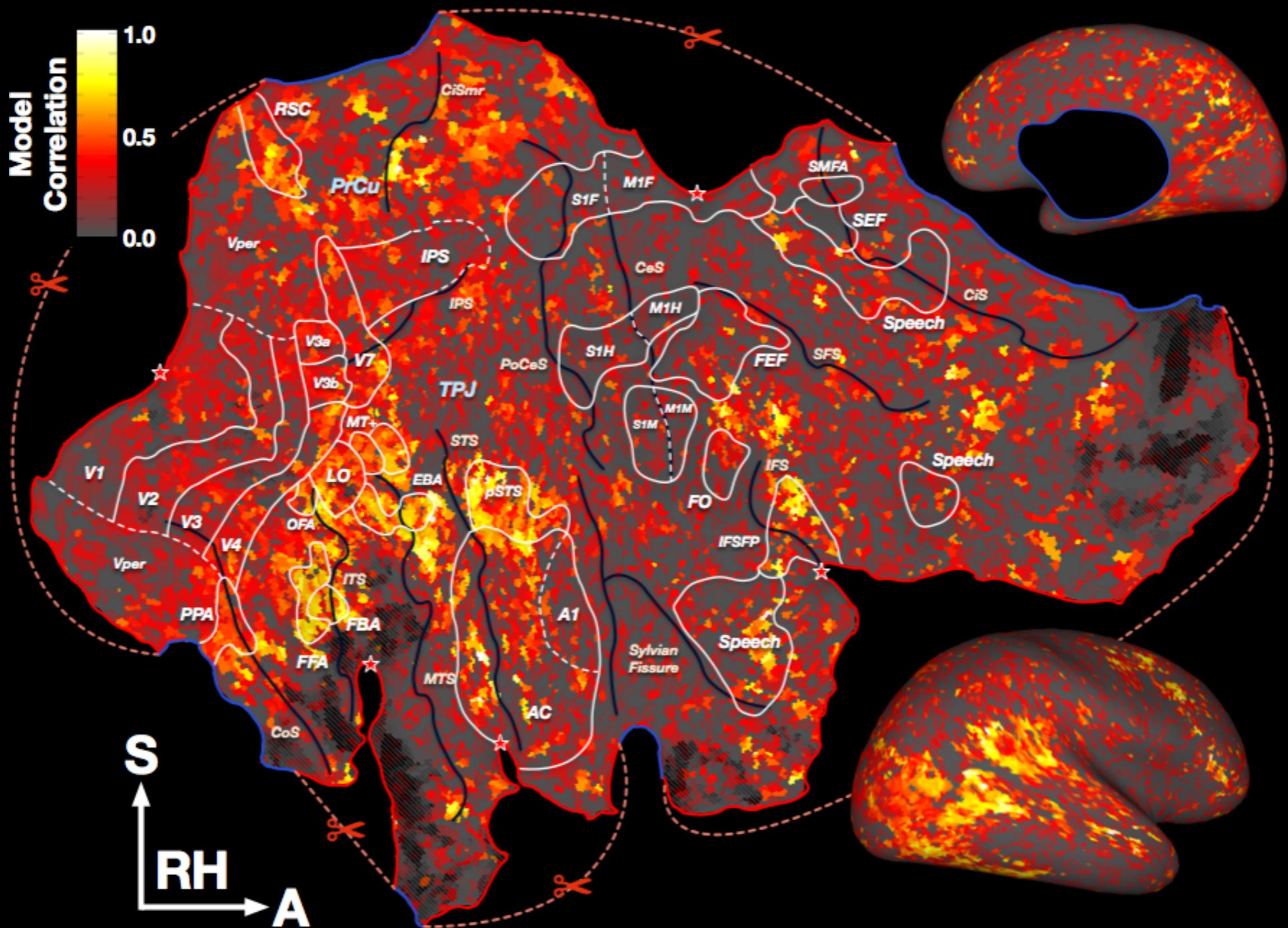
	Dog present?	Canine present?	Cat present?	Animal present?	Tree present?
Second 1	1	1	0	1	0
Second 2	0	0	1	1	1
Second 3	0	0	0	0	1
Second 4	0	1	0	1	0
	...				



Ridge Regression

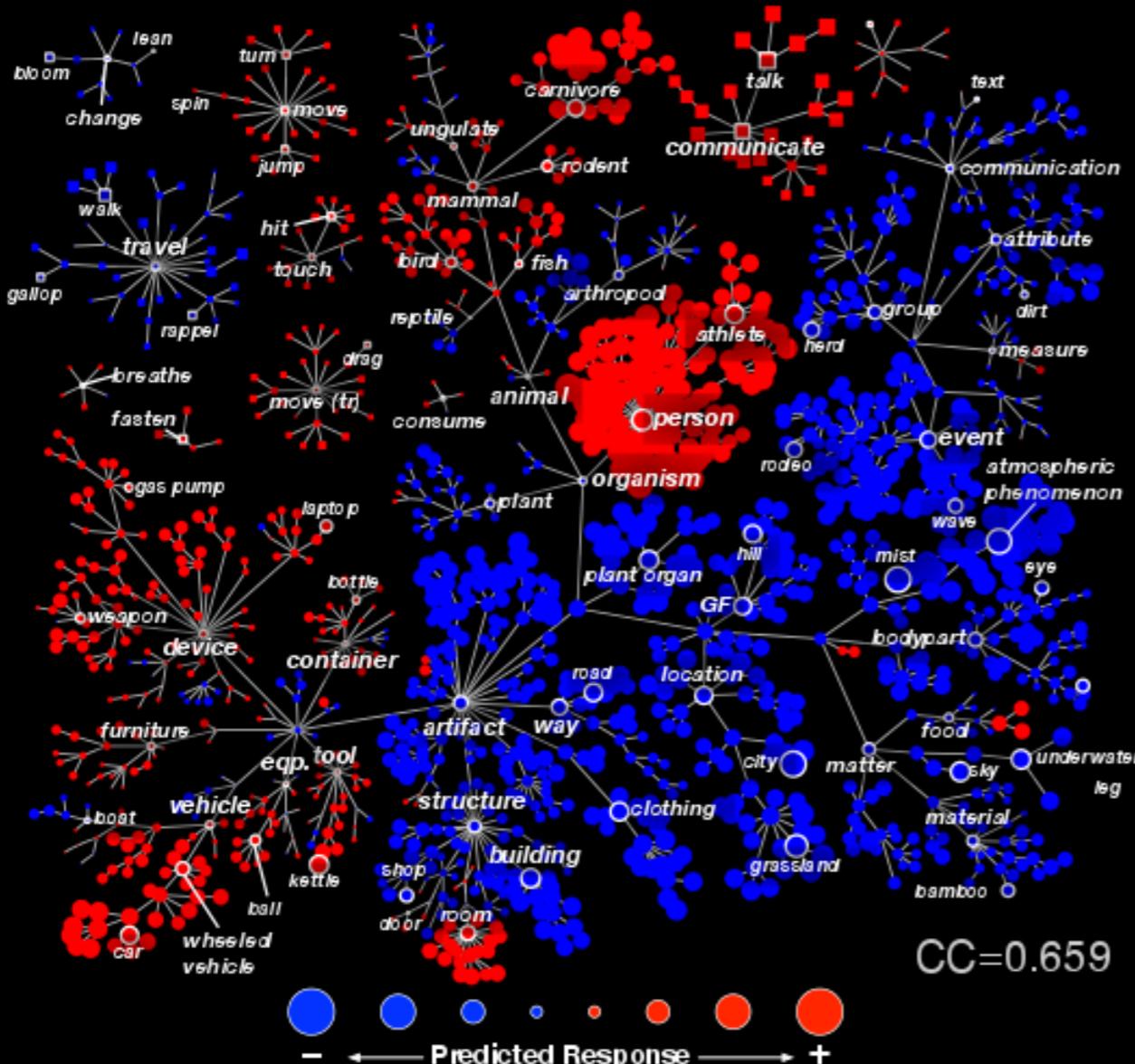


Predictions of the WordNet model

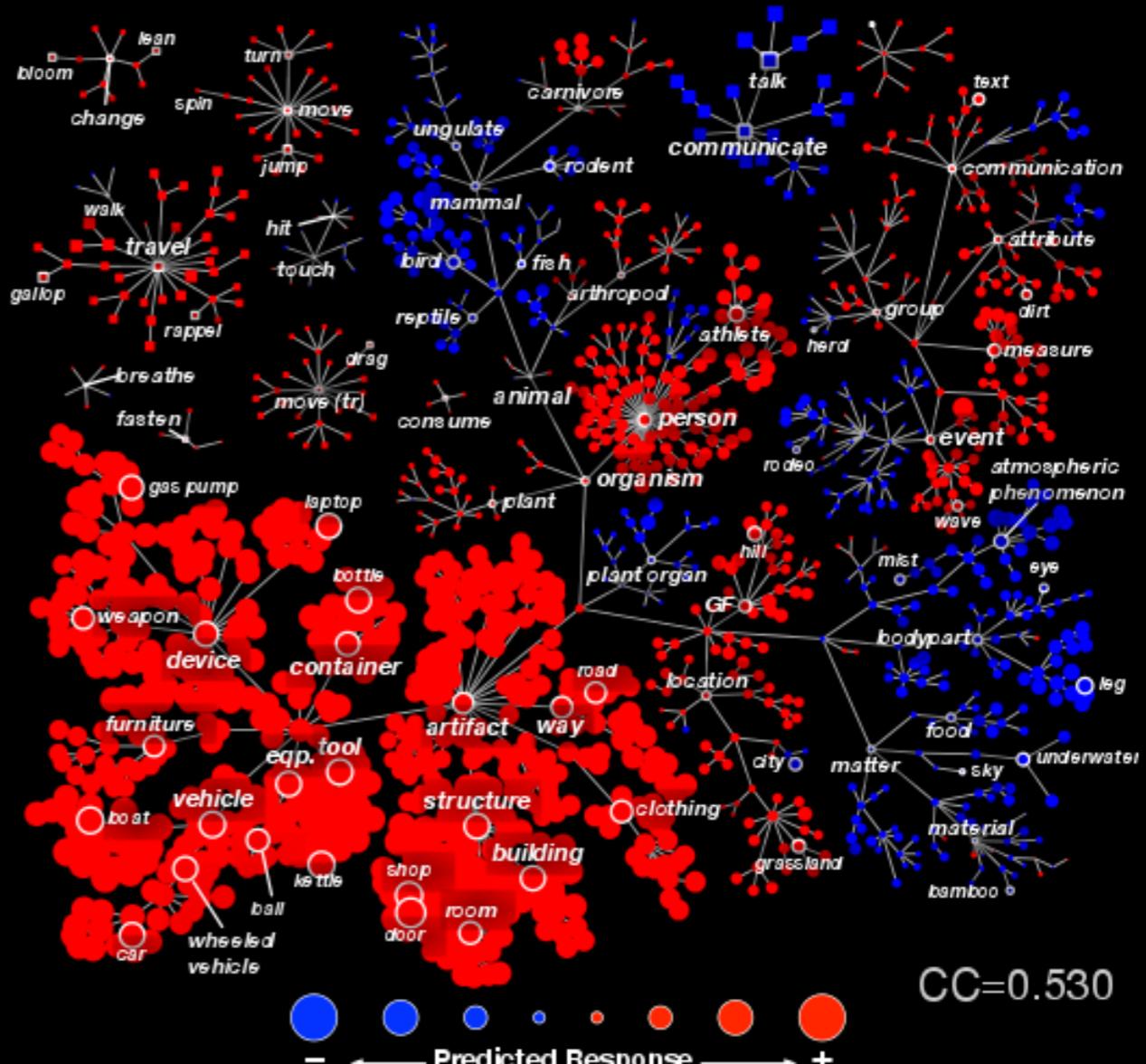


WordNet RF for two voxels

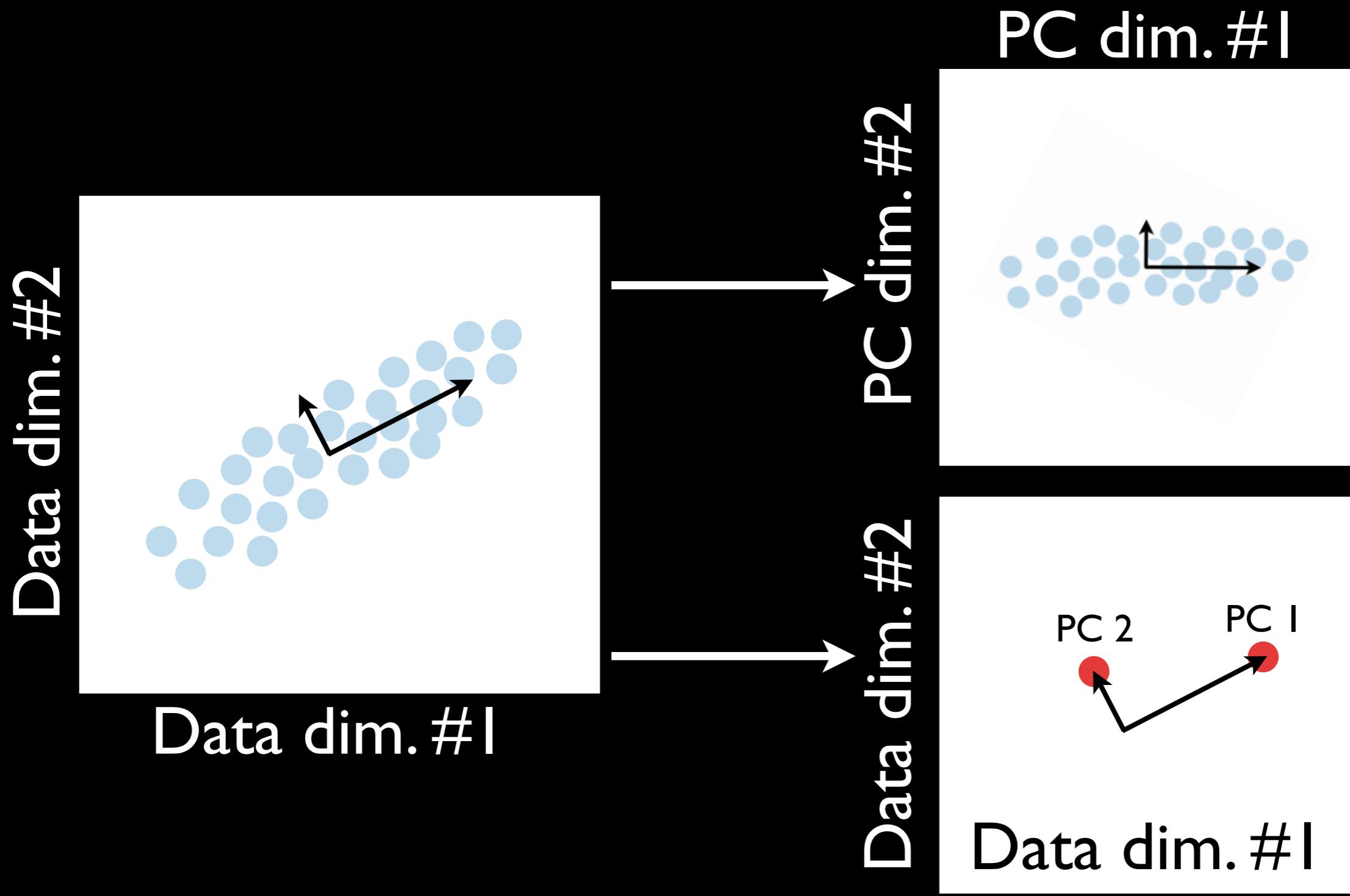
Voxel AV-19987 (right precuneus)



Voxel AV-8592 (left PPA)

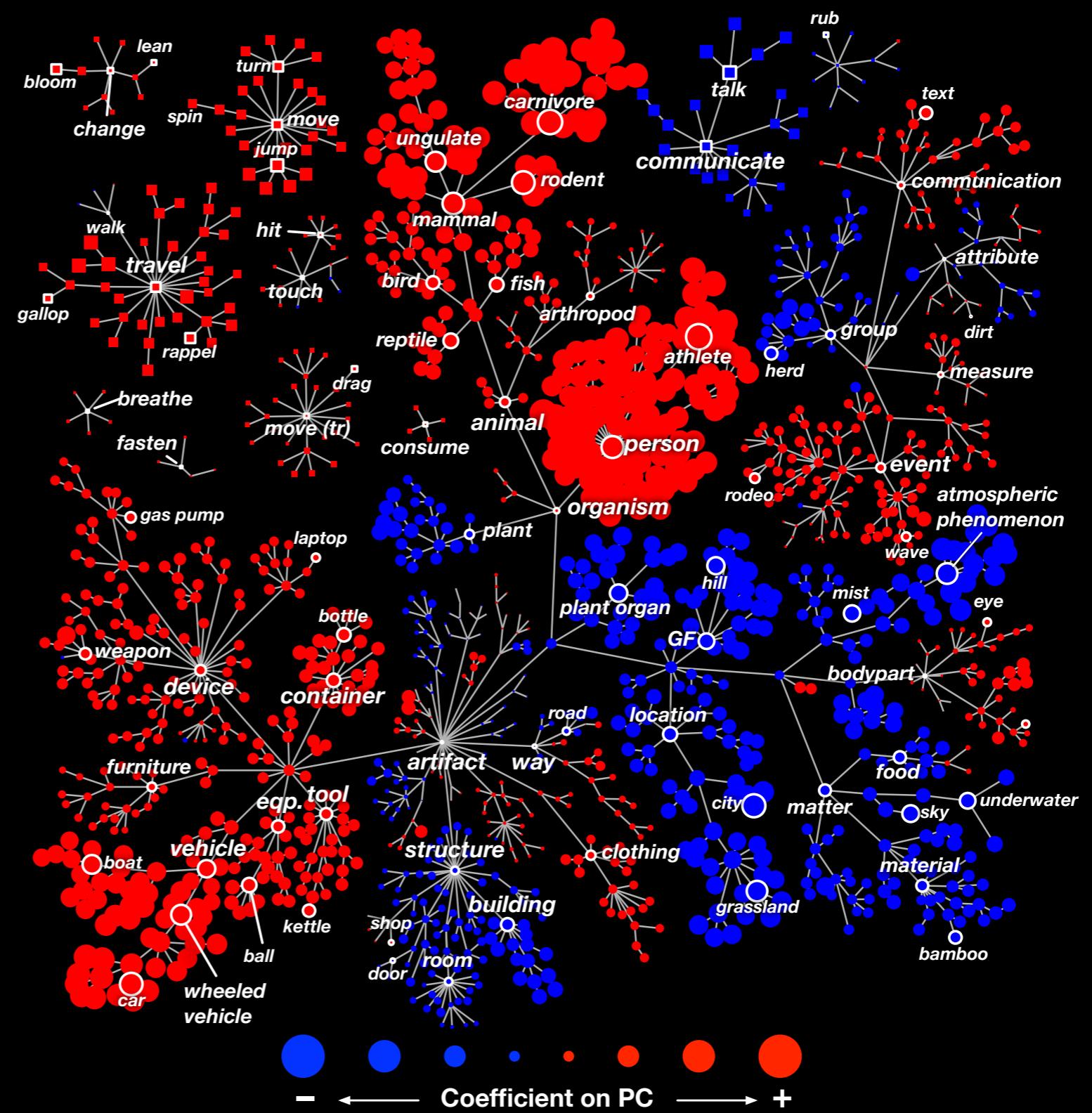


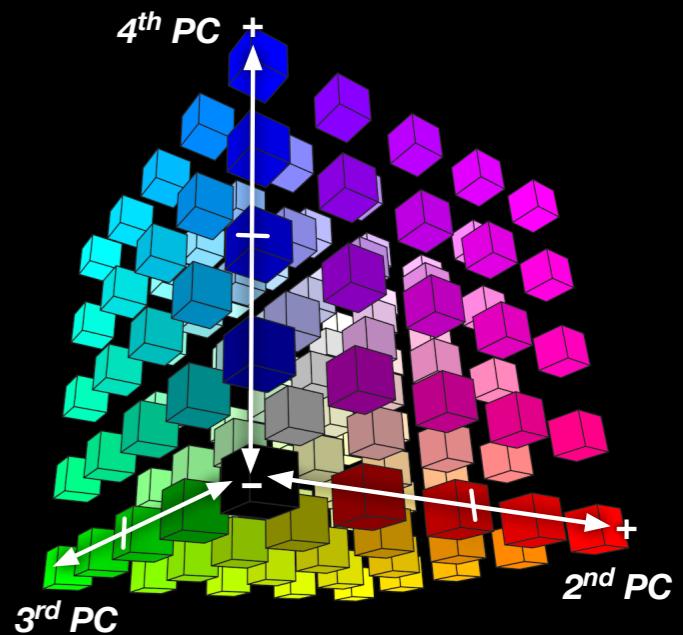
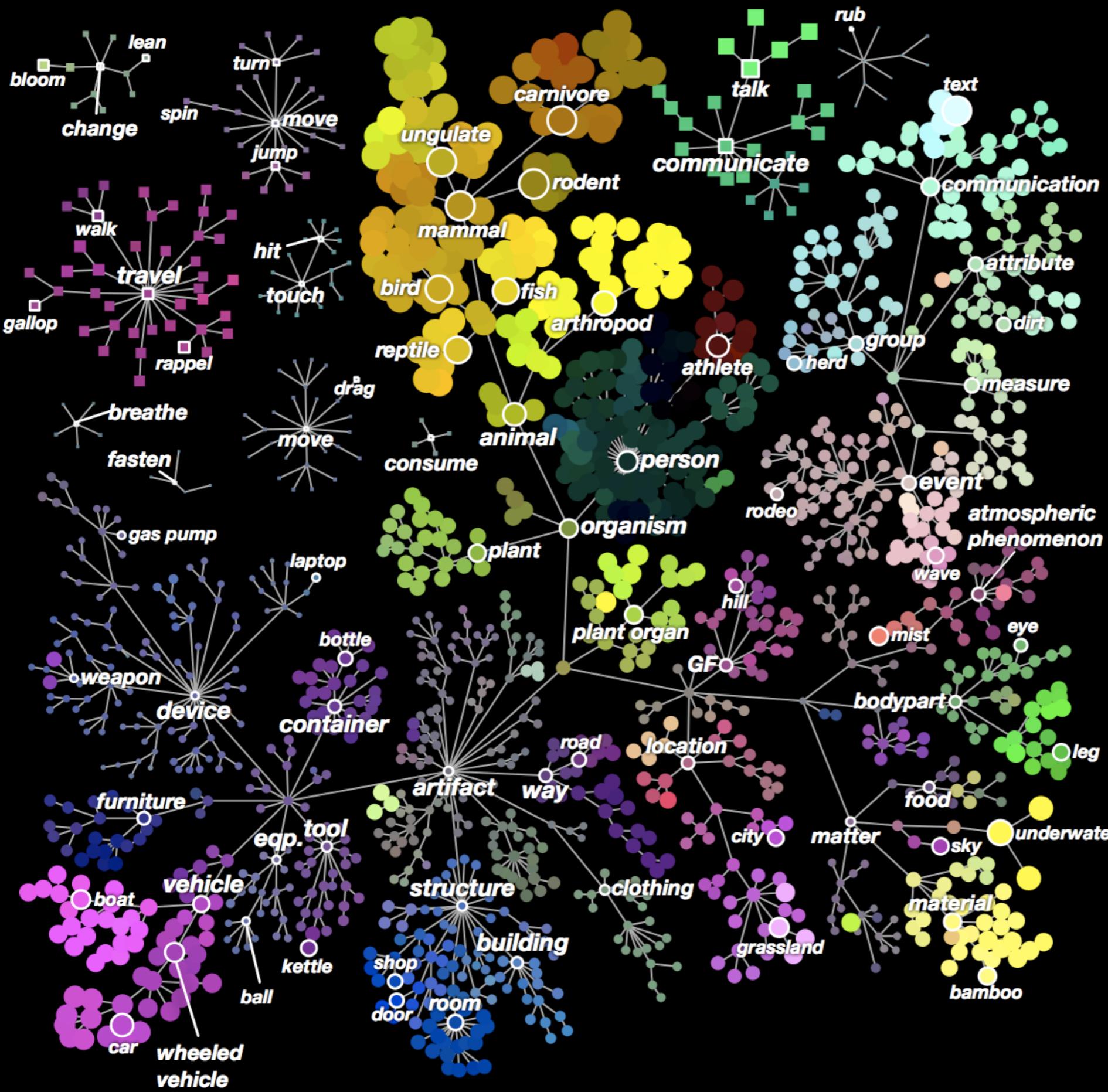
Principal Components Analysis (PCA)



First Principal Component

Lots of motion
vs.
Little motion



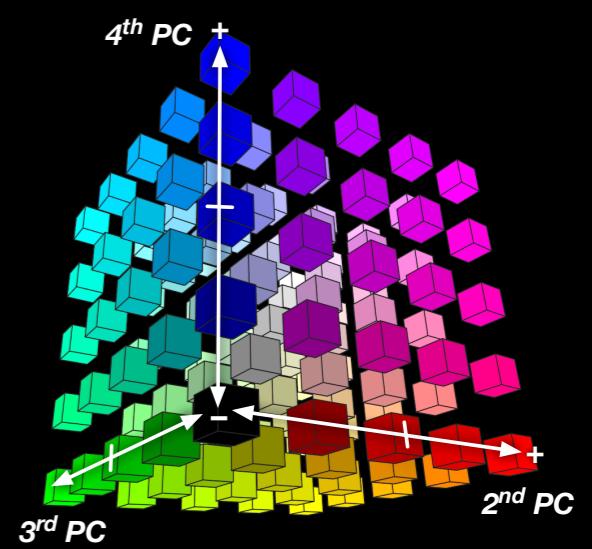
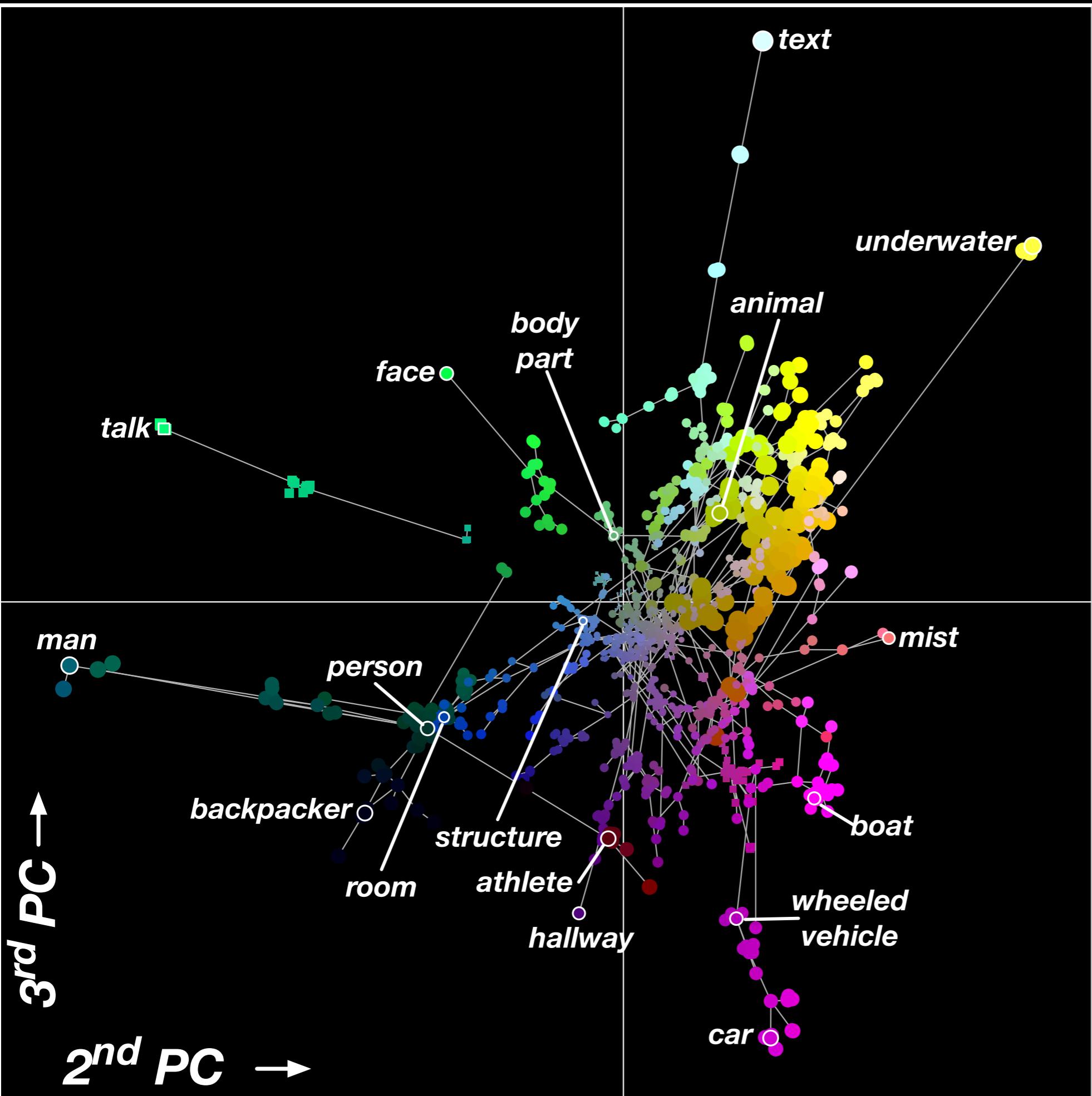


3-PC space RGB colormap

2nd PC = RED

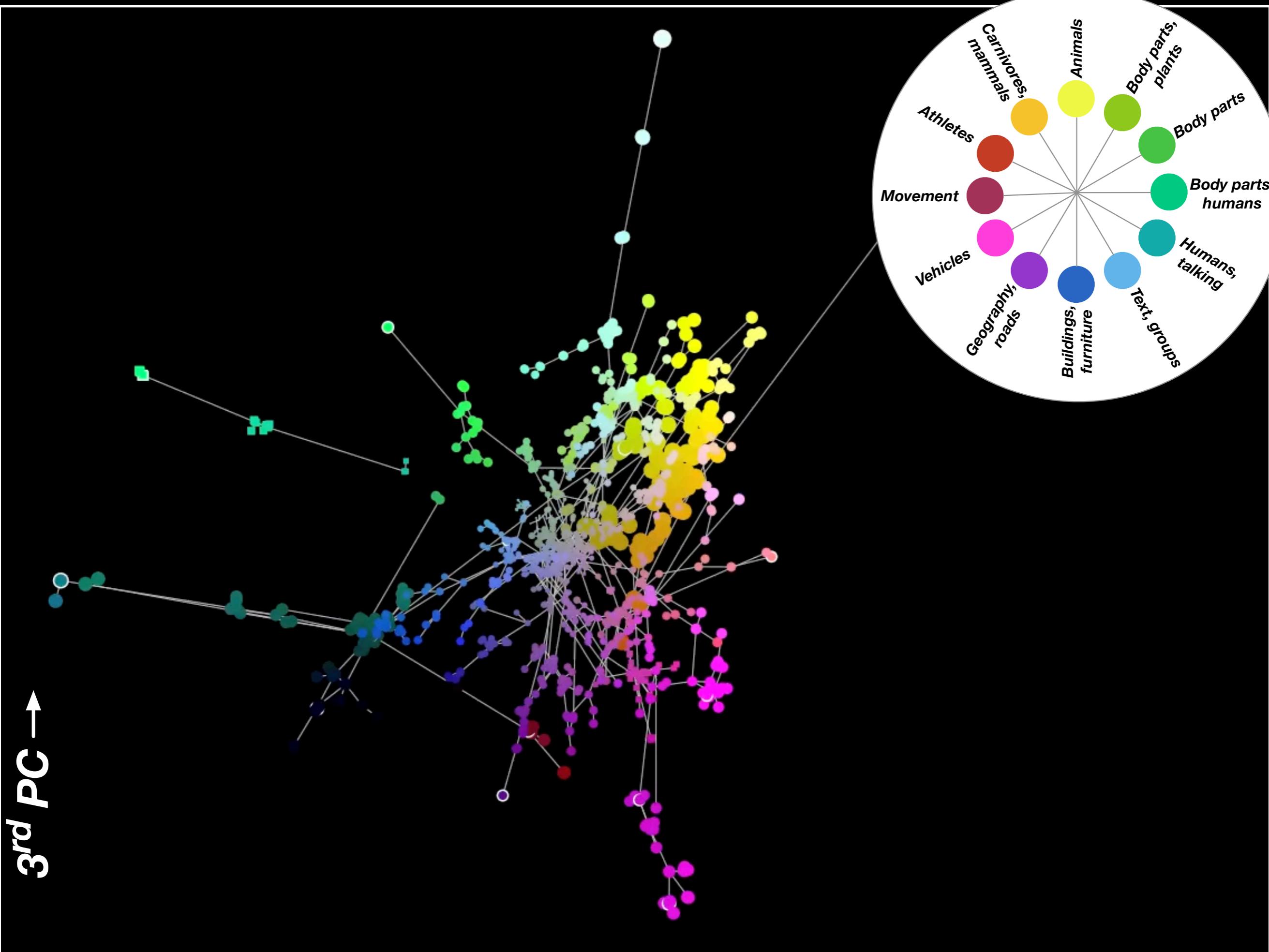
3rd PC = GREEN

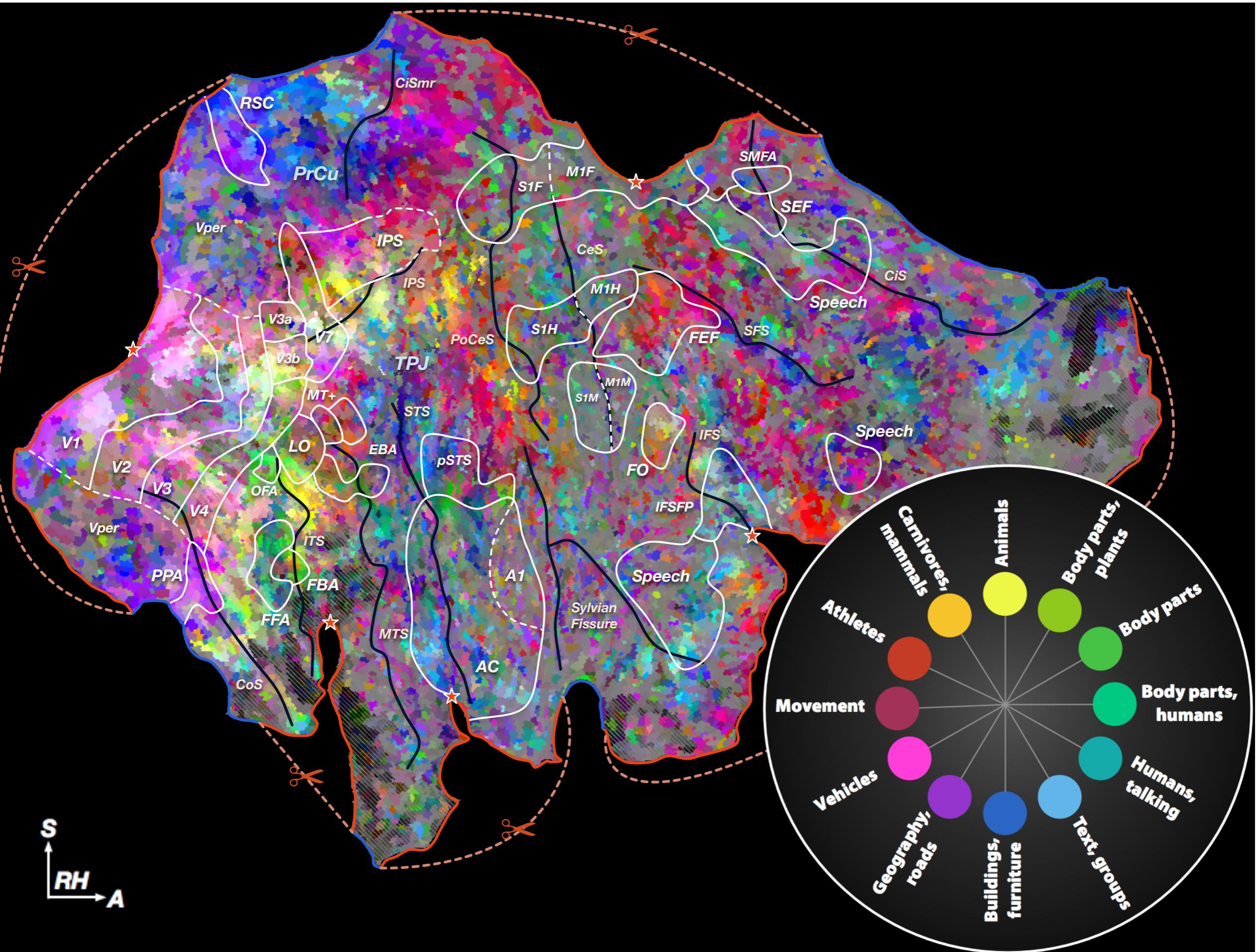
4th PC = BLUE



**3-PC space
RGB colormap**

2nd PC = RED
3rd PC = GREEN
4th PC = BLUE





Decoding

Movie Stimulus



Likely objects/actions

NEXT TIME

- * linear regression lab on wednesday!
- * bring your computers!

END