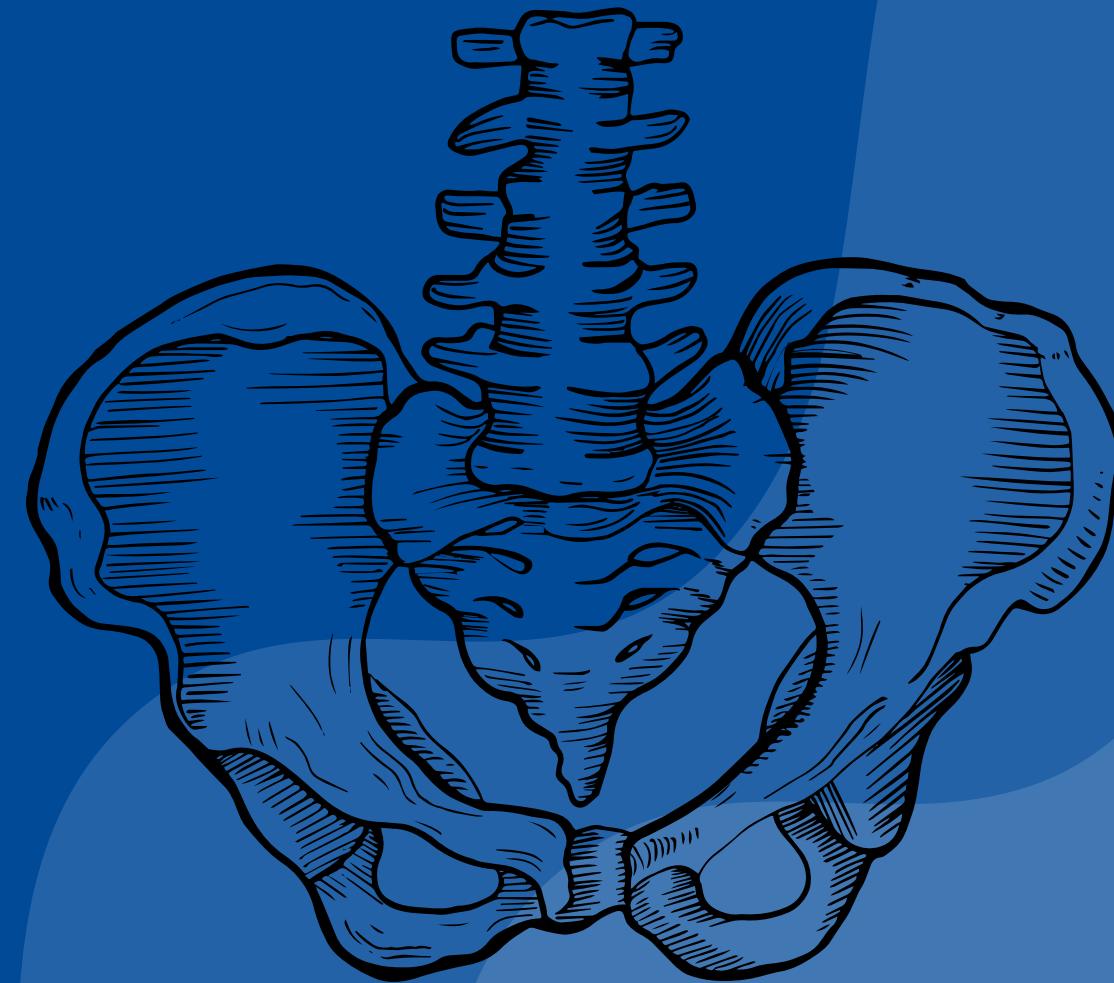


Heart diseases

Network analysis



Andreea STROIA

Agenda

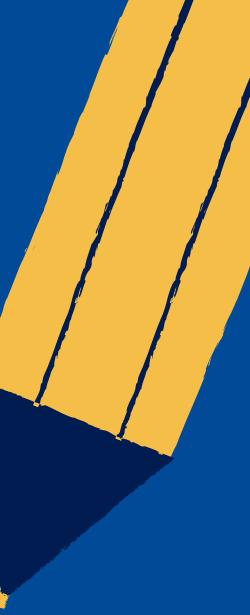
Research
Question

Insights
on data
&
EDA

Network
Analysis

Results
Conclusions
Limitations

Github



Research Question

- What's the importance of genes in a heart condition?
- What other diseases might influence heart diseases?

Hypothesis

- Not a very big percent of heart diseases are influenced by genes
- Other diseases(ex:Diabetes) might influence heart diseases



Insights on data

The DisGeNET database shows information of human gene-disease associations

- 17 columns
- 5642 rows

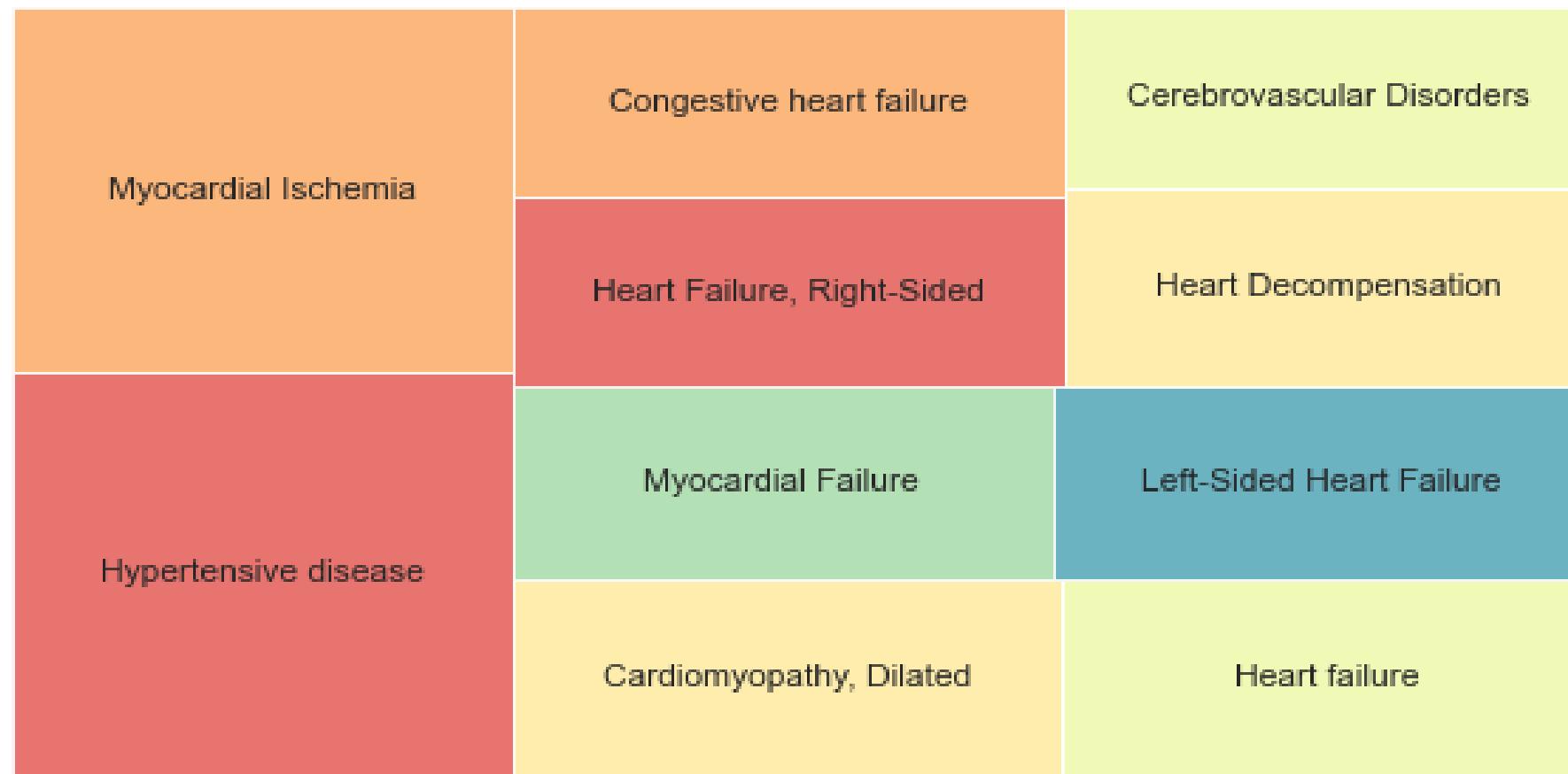
Score

the number and type of sources
the number of publications supporting the association

genelid	geneSymbol	DSI	DPI	diseaseld	ID_Disease	diseaseName	diseaseType	diseaseClass	diseaseSemanticType	score	EI	YearInitial	YearFinal	
0	10	NAT2	0.466	0.828	C0010054	44	Coronary Arteriosclerosis	disease	C14	Disease or Syndrome	0.30	NaN	2011.0	2011.0
1	10	NAT2	0.466	0.828	C1956346	67	Coronary Artery Disease	disease	C14	Disease or Syndrome	0.30	NaN	2011.0	2011.0
2	19	ABCA1	0.484	0.793	C0004153	158	Atherosclerosis	disease	C14	Disease or Syndrome	0.40	1.0	2000.0	2017.0
3	19	ABCA1	0.484	0.793	C1563937	171	Atherogenesis	phenotype	C14	Pathologic Function	0.30	NaN	2012.0	2012.0
4	25	ABL1	0.475	0.690	C0018798	221	Congenital Heart Defects	group	C14;C16	Congenital Abnormality	0.31	1.0	2017.0	2017.0

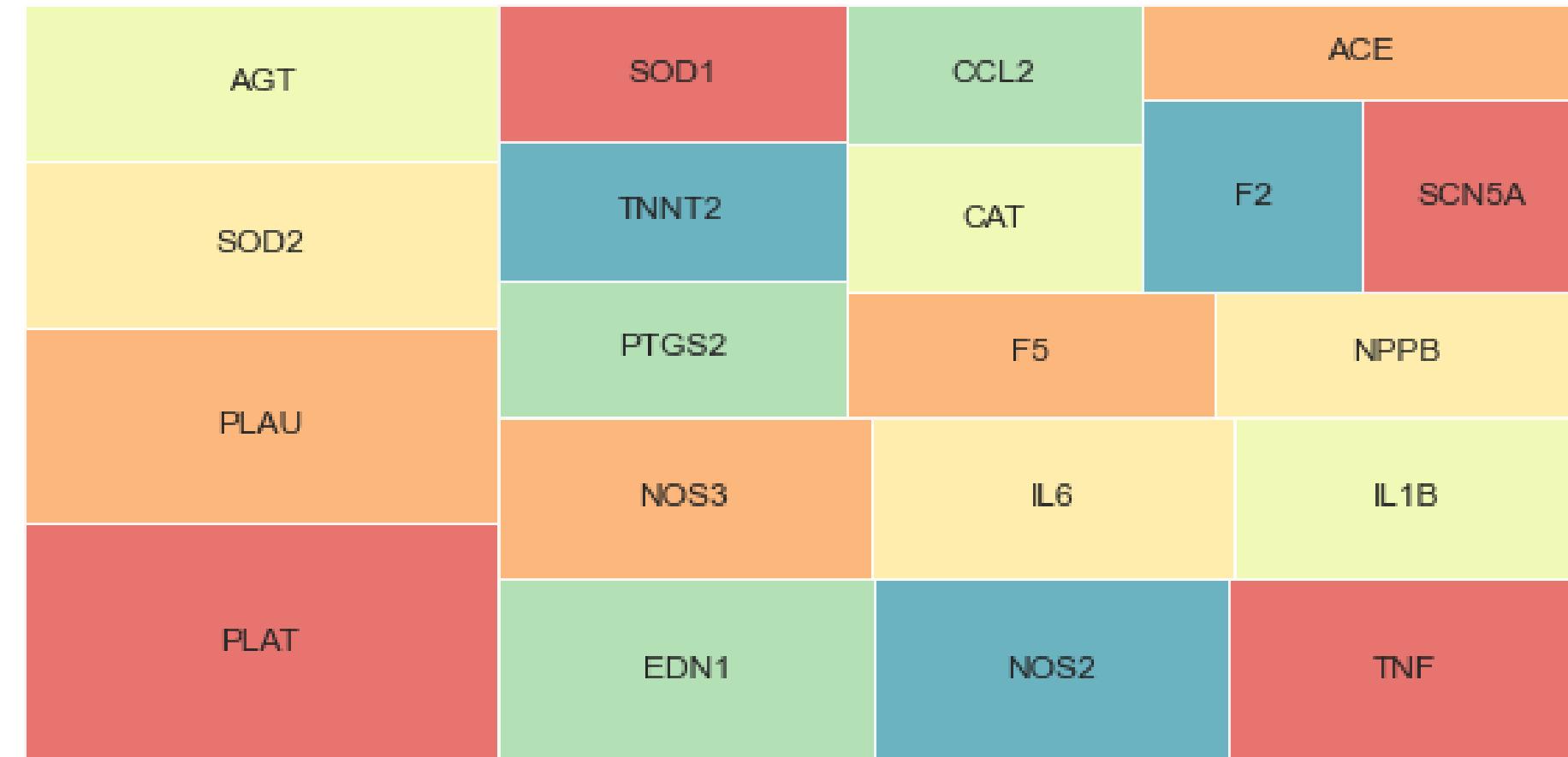
Shape of the data

Distribution of top 10 heart diseases in the dataset



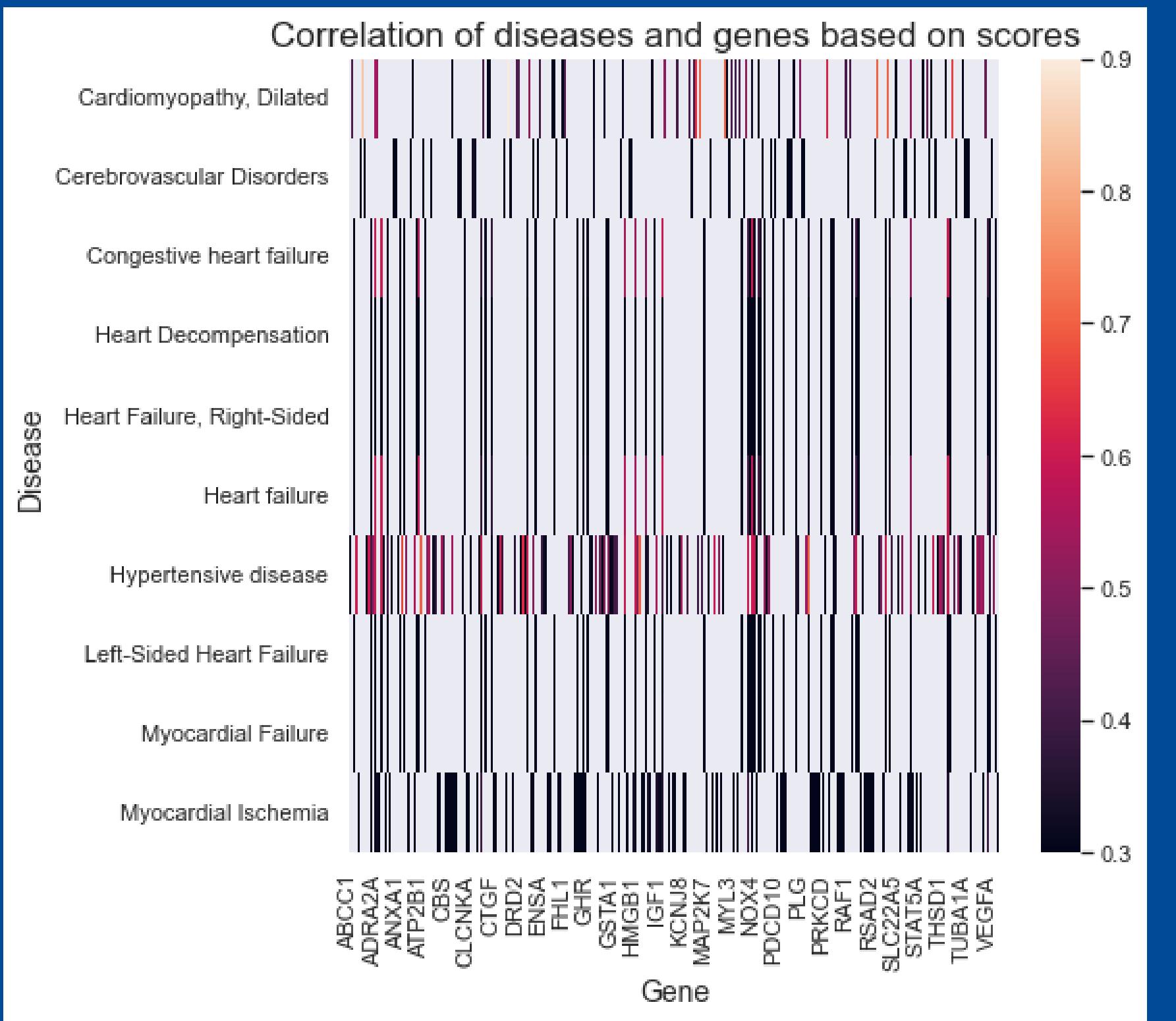
Diseases

Distribution of top 20 genes in the dataset



Genes

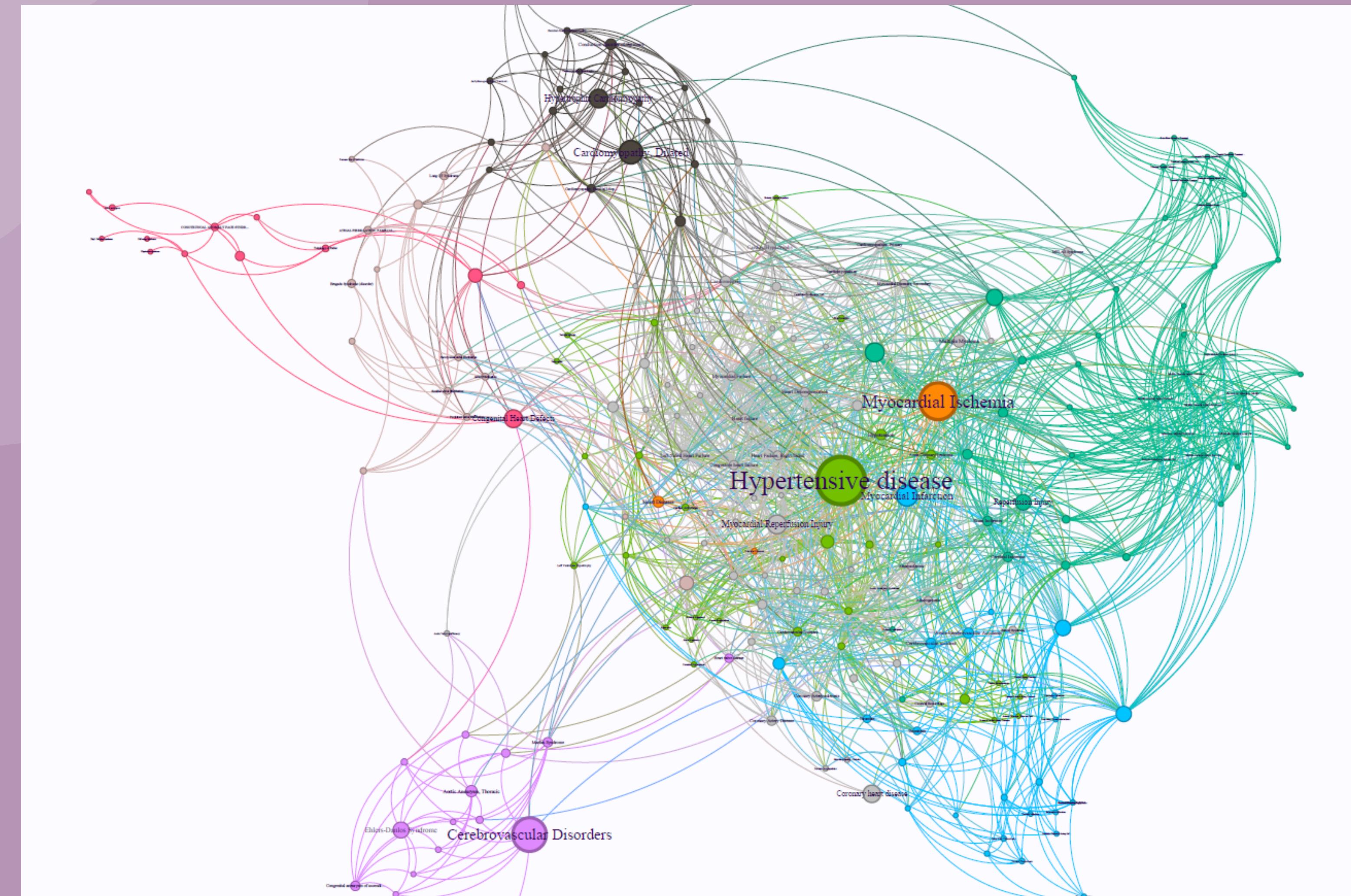
Correlation between genes and diseases



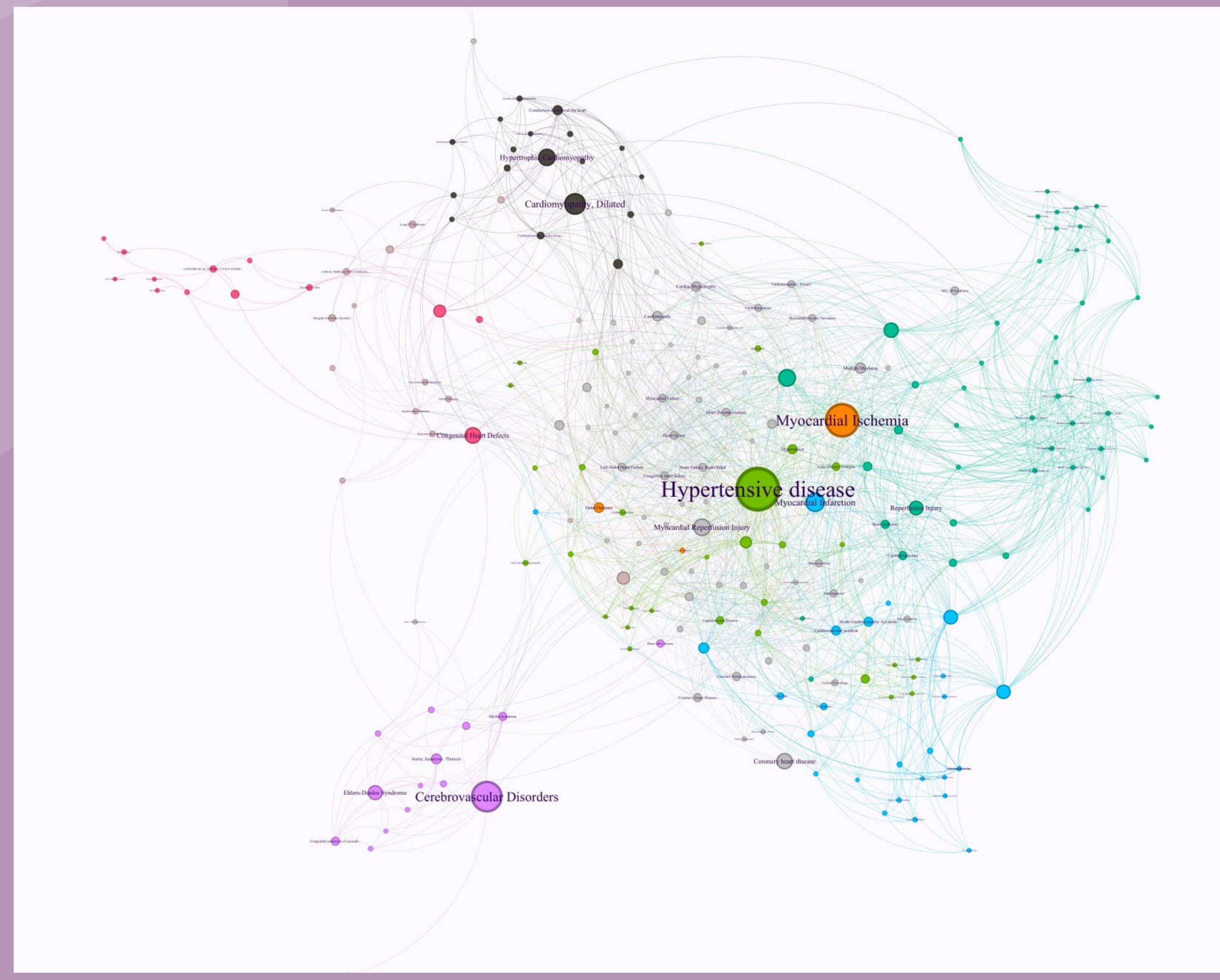
Let's see the
network...



Stage 1



Stage 2



Network analysis



Metrics used

- Modularity -> Communities
- Filtering by degree -> 10
- Node Size -> Betweenness Centrality

Disease inspection

- Cardiomyopathy Dilated
- Hypertensive disease
- Myocardial Infarction
- Myocardial Ischemia

Some info on diseases..

Cardiomyopathy Dilated

- causes the heart chambers (ventricles) to thin and stretch, growing larger.
- Dilated cardiomyopathy makes it harder for the heart to pump blood to the rest of the body.

Hypertensive disease

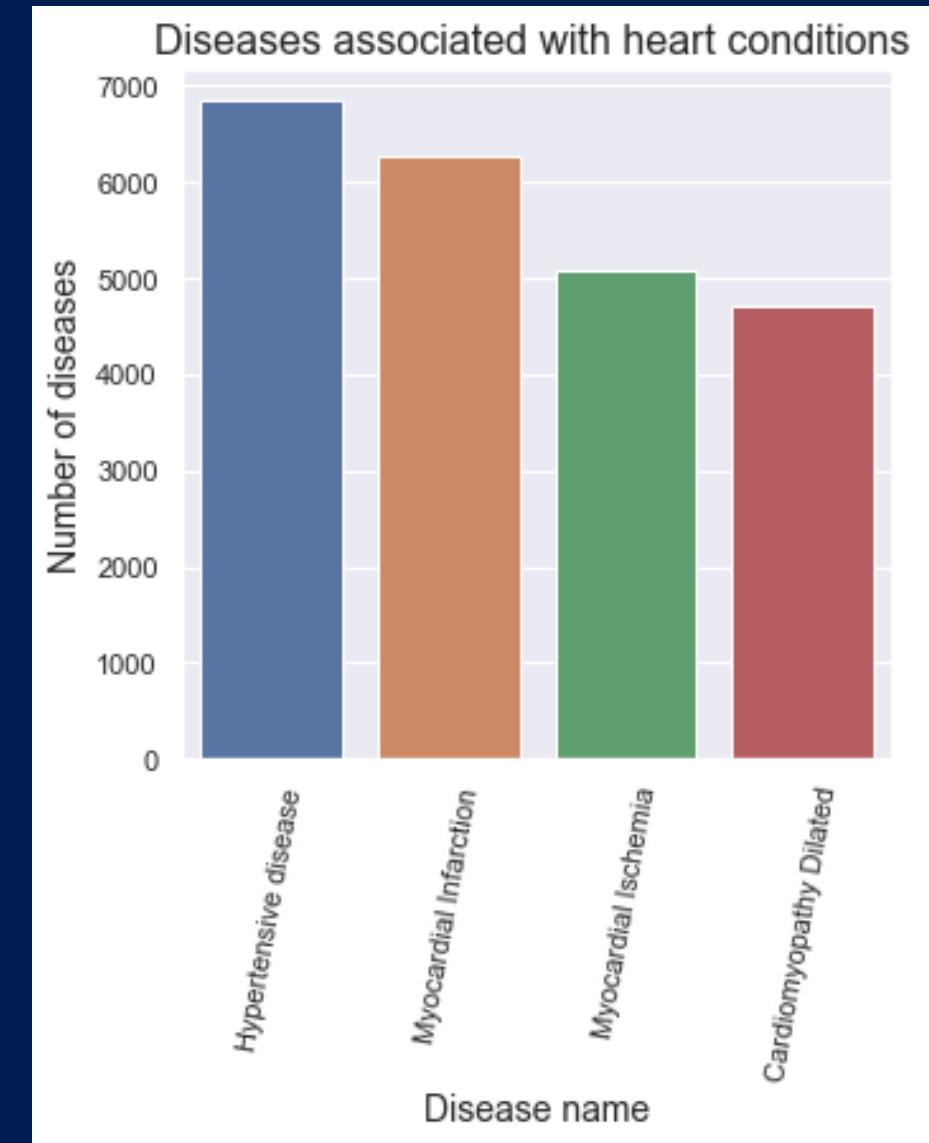
- If you have high blood pressure, the force of the blood pushing against the artery walls is consistently too high

Myocardial Ischemia

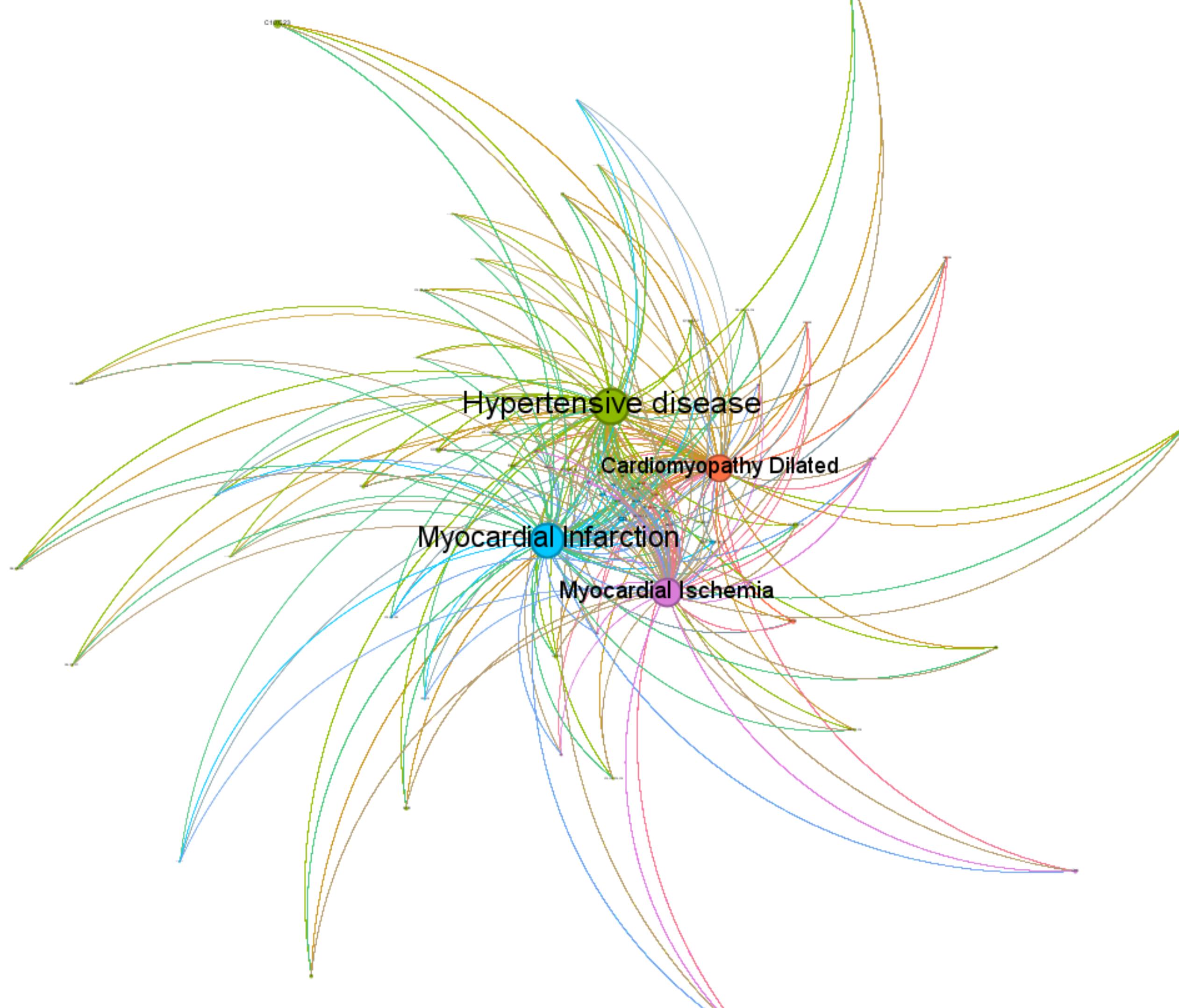
- happens when one or more areas of the heart muscle don't get enough oxygen

Disease-disease association

Jaccard index
number of shared
genes
between pairs of
diseases,
by source



Index_disease_id	Index_disease	Associated_disease_id	Associated_disease	Class	Jlg
0	C0007193	Cardiomyopathy Dilated	C0000737	Abdominal Pain	C23 0.054404
1	C0007193	Cardiomyopathy Dilated	C0000744	Abetalipoproteinemia	C16;C18 0.015845
2	C0007193	Cardiomyopathy Dilated	C0000768	Congenital Abnormality	C16 0.066932
3	C0007193	Cardiomyopathy Dilated	C0000772	Multiple congenital anomalies	C16 0.026918
4	C0007193	Cardiomyopathy Dilated	C0000786	Spontaneous abortion	C13 0.026393



Before degree filtering
641 nodes
around 20062 edges

Results

C23 – pathological conditions, signs and symptoms

C15 – hemic and lymphatic diseases

C08 – respiratory tract diseases

C10 – nervous system diseases

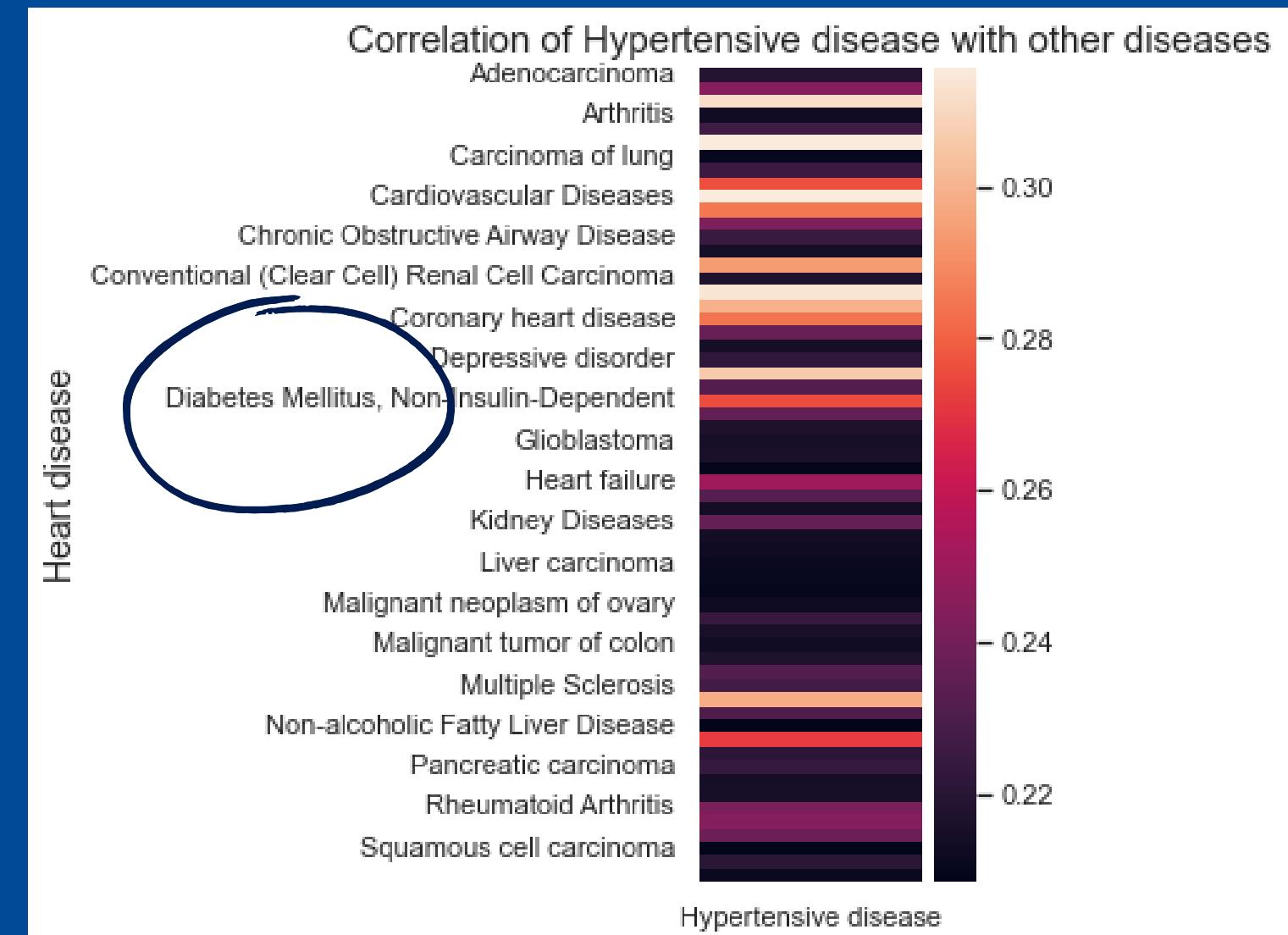
Hypertensive disease

Genes likely play some role in high blood pressure, heart disease, and other related conditions.

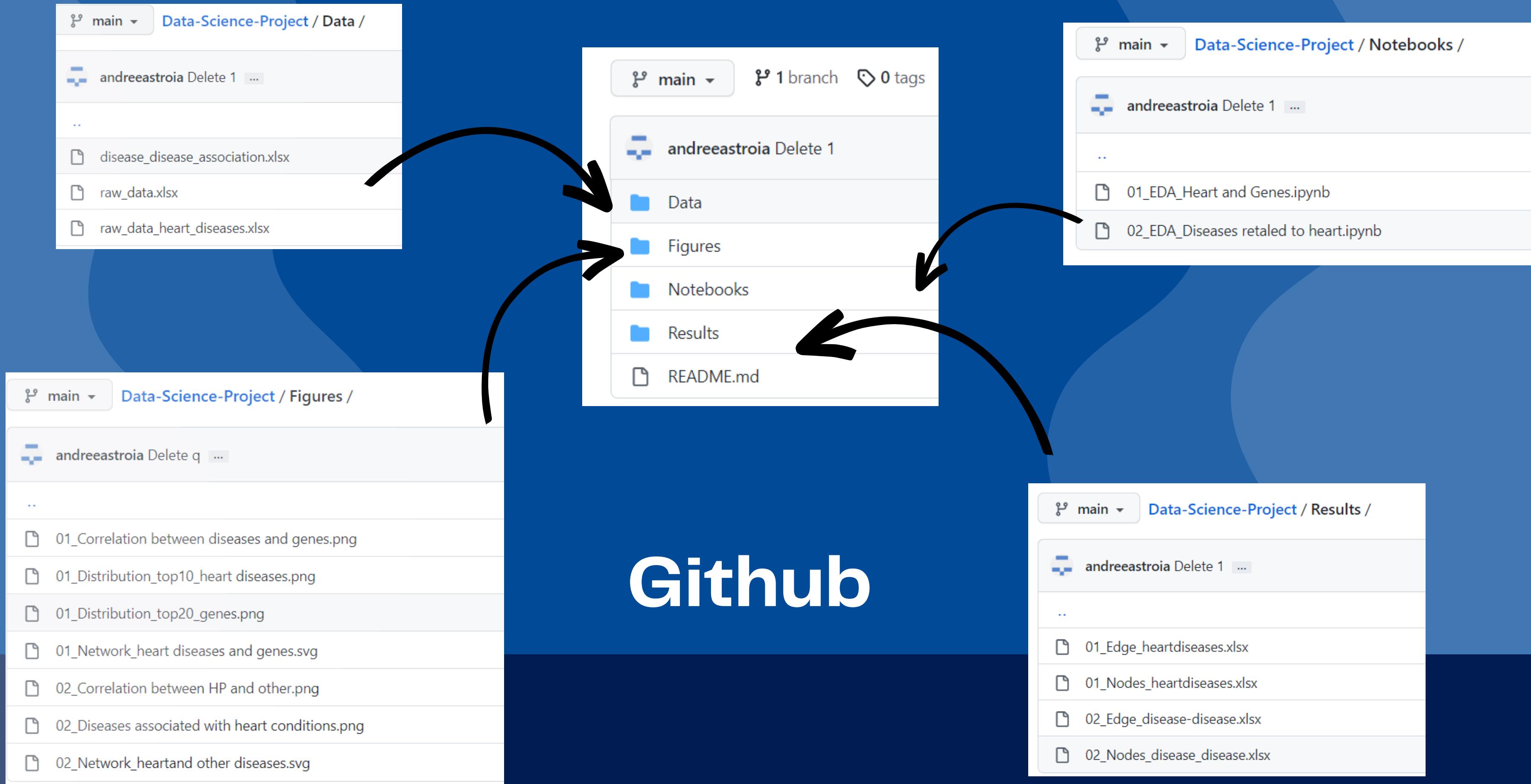
Further analysis

Exploration of genes that connect with other diseases and have been involved in the heart conditions

Filter diseases



Github



Thank you for
your attention!

