# Lab Book 27_11_15

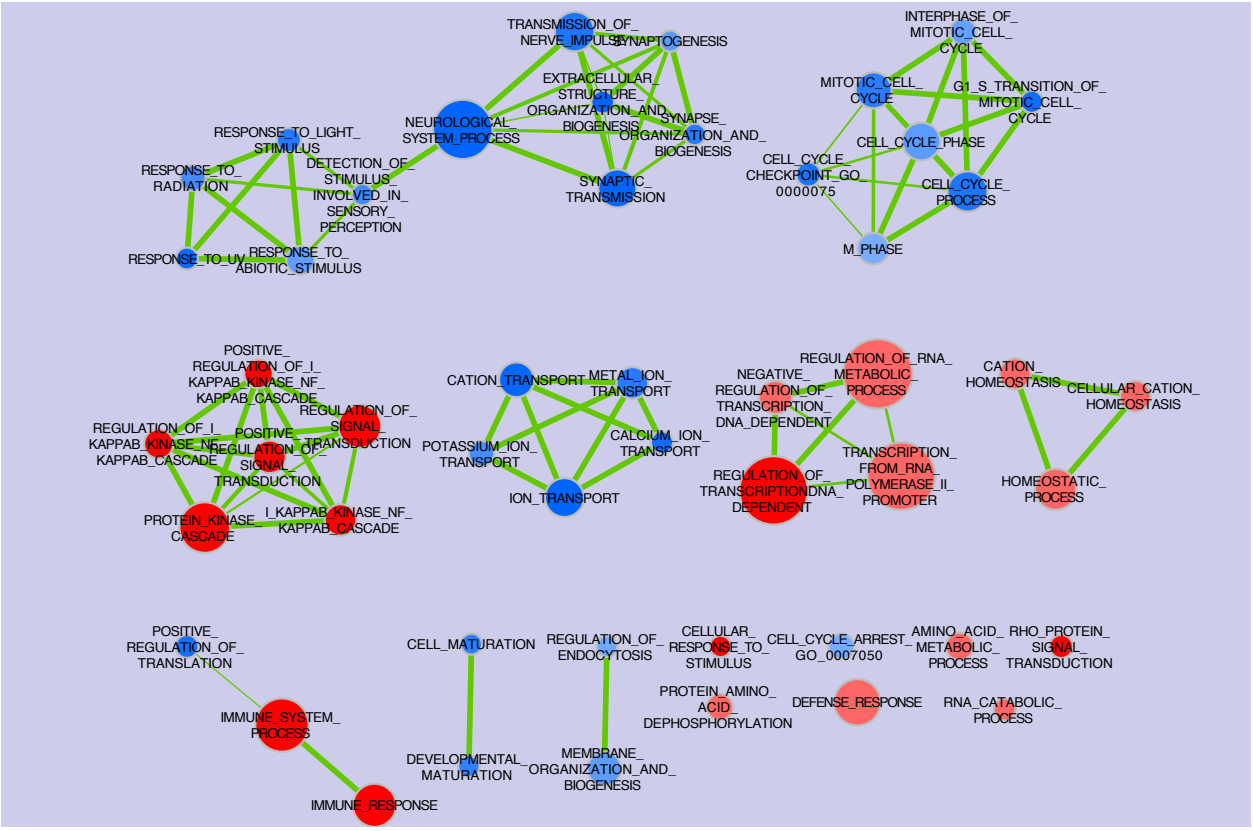
*Claire Green*

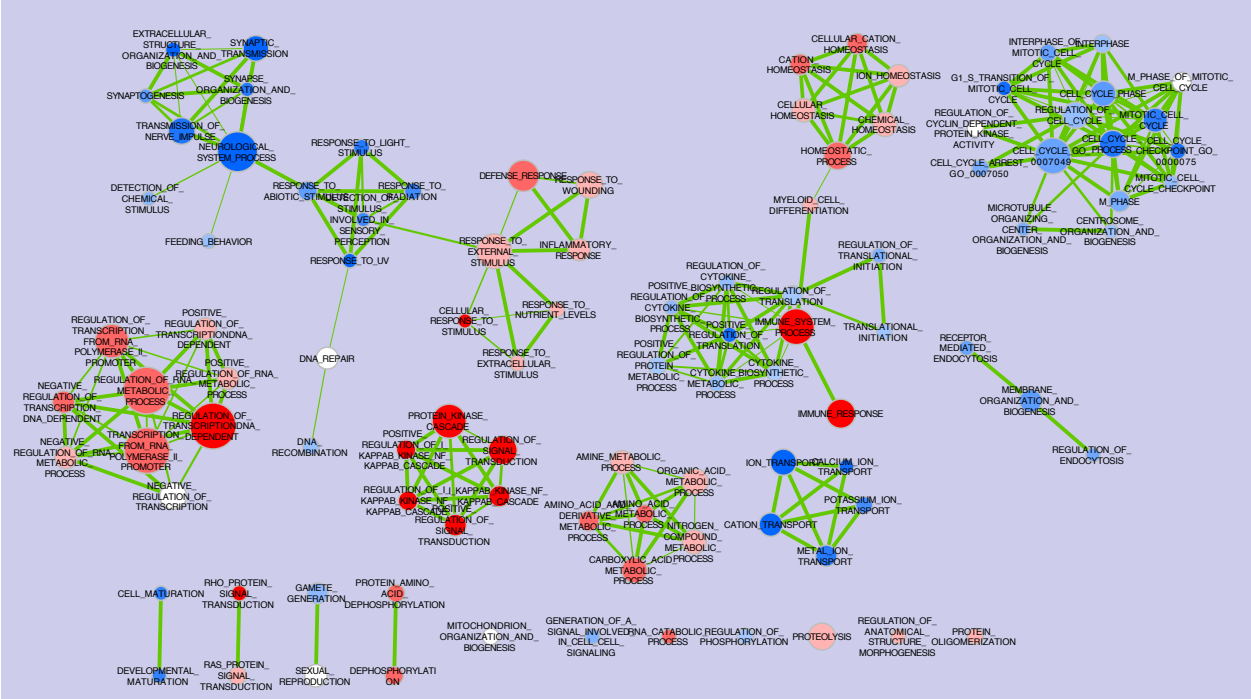
*24 November 2015*

## Monday

On monday I continued conducting GSEA analysis and getting to grips with Cytoscape. I've decided that the best methodology is to use the R script to generate the files I need for GSEA analysis and then use the Java platform to run the actual analysis. This is because it is much faster and the output is compatible with Cytoscape.

I was able to generate a list of DE pathways for C9orf72, and imported the top 50 and top 100 pathways into cytoscape. This produced the following diagrams:





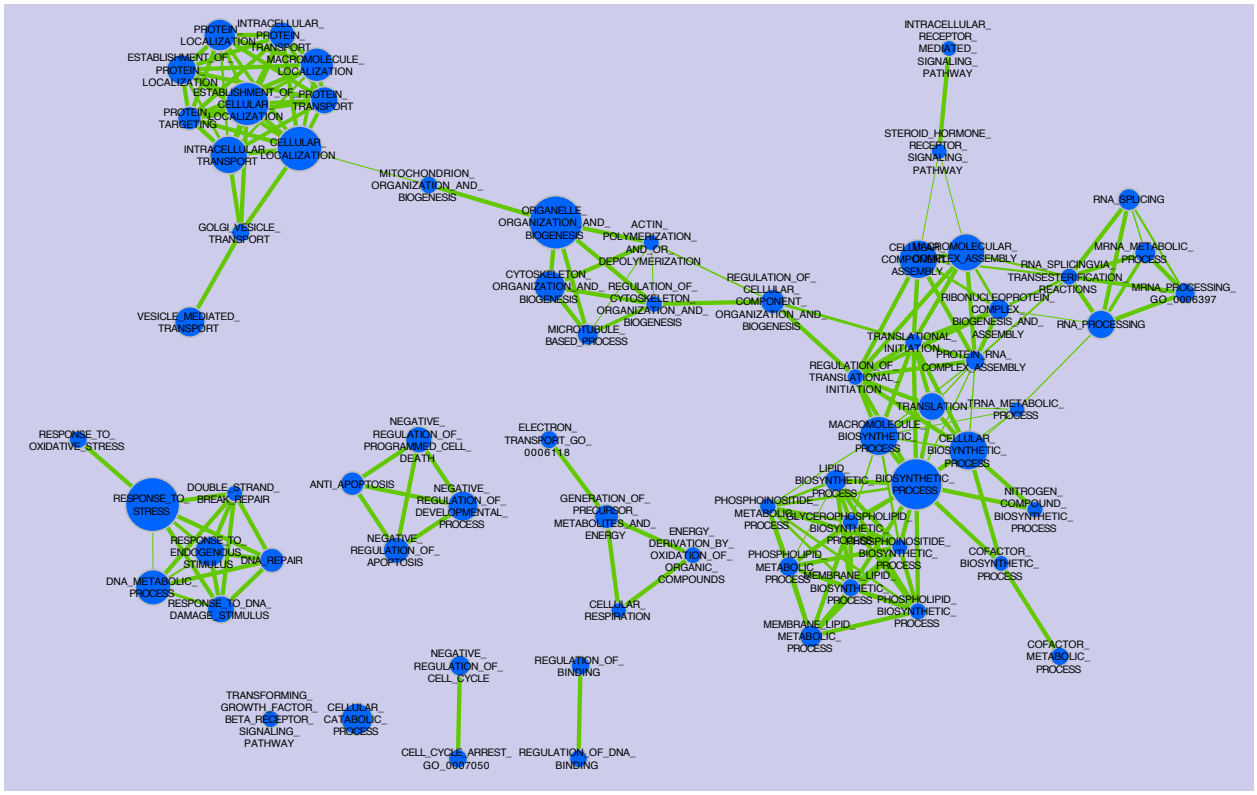

## Tuesday

On Tuesday I spent some time on my EdX course and then ran the GSEA for CHMP2B and sALS.

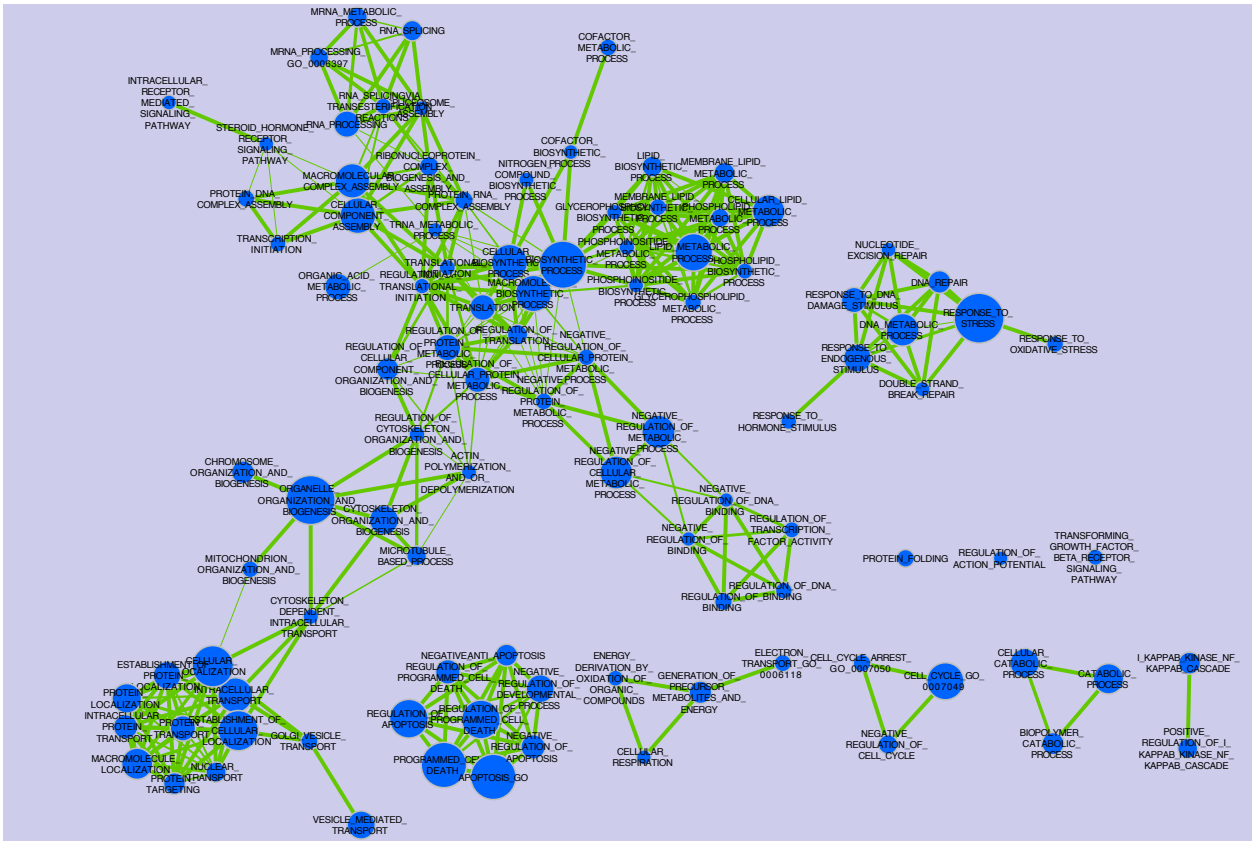
## Wednesday

On Wednesday, I imported the CHMP2B and sALS data in to Cytoscape to visualise the networks.

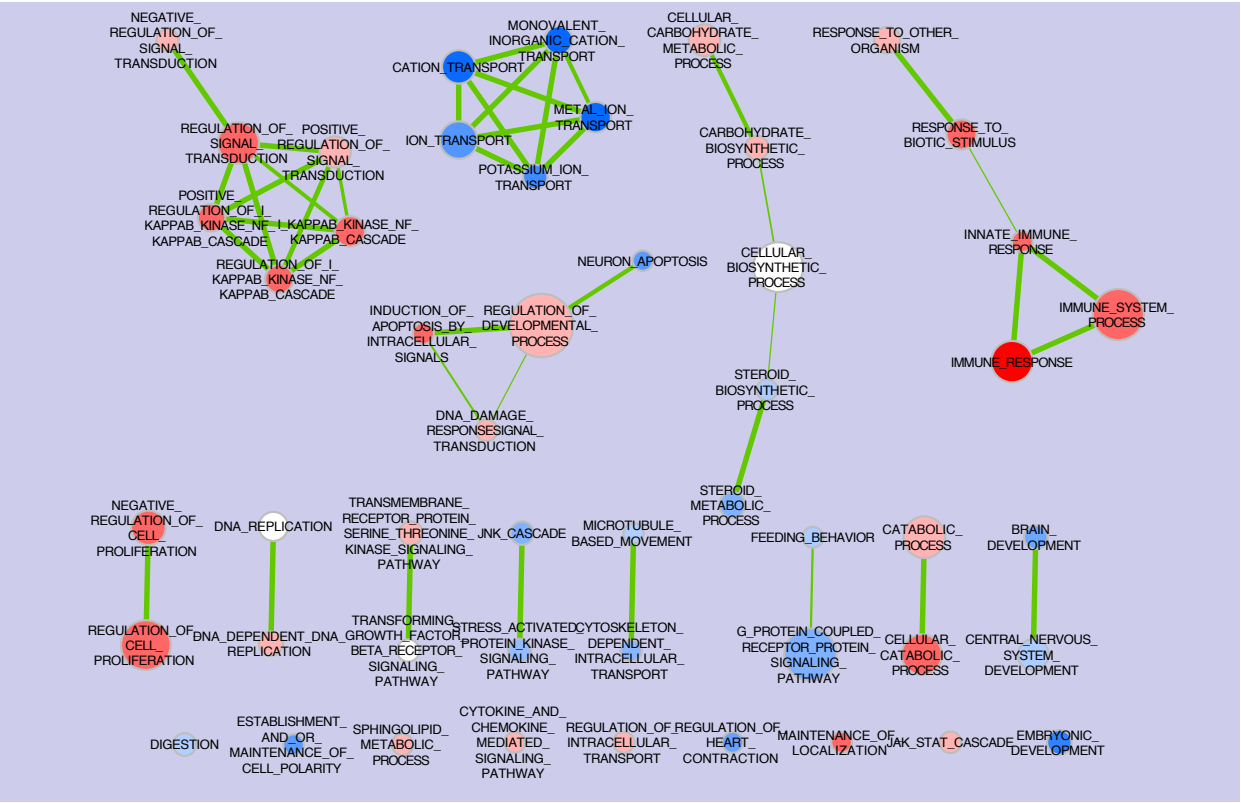
## CHMP2B top 50



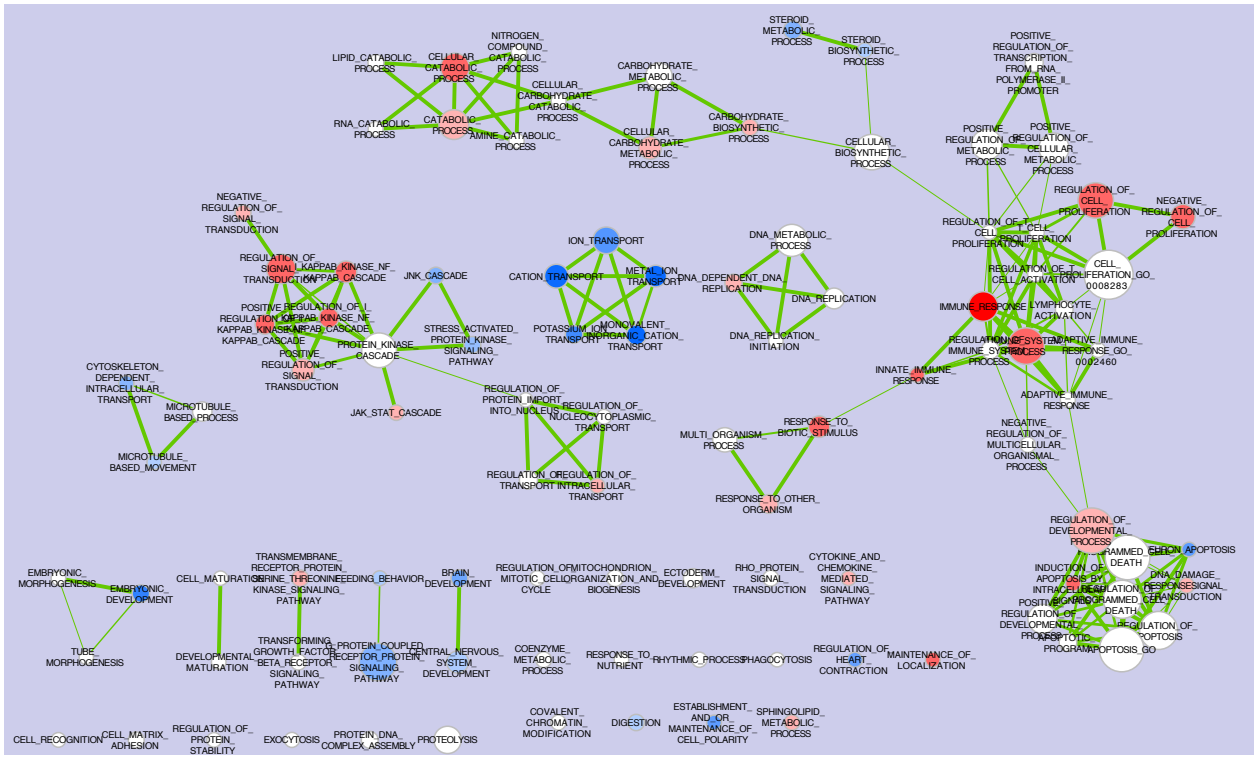
## CHMP2B top 100



## sALS top 50

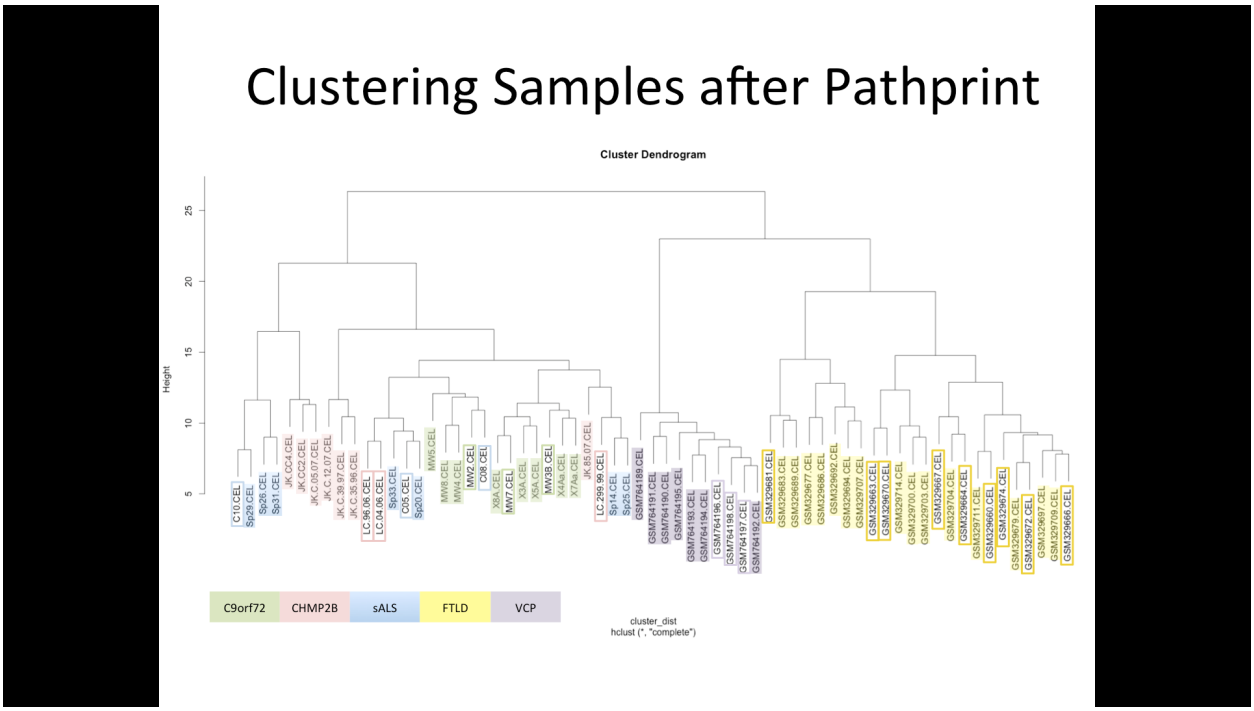

NEGATIVE_ REGULATION_OF_ SIGNAL_ TRANSDUCTION
MONOVALENT_ INORGANIC_CATION_ TRANSPORT
CELLULAR_ CARBOHYDRATE_ METABOLIC_ PROCESS
RESPONSE_TO_OTHER_ ORGANISM
CATION_TRANSPORT
METAL_ION_ TRANSPORT
REGULATION_OF_ SIGNAL_ TRANSDUCTION
POSITIVE_ REGULATION_OF_ SIGNAL_ TRANSDUCTION
ION_TRANSPORT
CARBOHYDRATE_ BIOSYNTHETIC_ PROCESS
RESPONSE_TO_ BIOTIC_STIMULUS
POTASSIUM_ION_ TRANSPORT
POSITIVE_ REGULATION_OF_I_ KAPPAB_KINASE_NF_ KAPPAB_CASCADE
I_KAPPAB_KINASE_NF_ KAPPAB_CASCADE
REGULATION_OF_I_ KAPPAB_KINASE_NF_ KAPPAB_CASCADE
NEURON_APOPTOSIS
CELLULAR_ BIOSYNTHETIC_ PROCESS
INNATE_IMMUNE_ RESPONSE
IMMUNE_SYSTEM_ PROCESS
INDUCTION_OF_ APOPTOSIS_BY INTRACELLULAR_ SIGNALS
REGULATION_OF_ DEVELOPMENTAL_ PROCESS
IMMUNE_RESPONSE
STEROID_ BIOSYNTHETIC_ PROCESS
DNA_DAMAGE_ RESPONSESIGNAL_ TRANSDUCTION
STEROID_ METABOLIC_ PROCESS
NEGATIVE_ REGULATION_OF_ CELL_ PROLIFERATION
DNA_REPLICATION
TRANSMEMBRANE_ RECEPTOR_PROTEIN_ SERINE_THREONINE_ KINASE_SIGNALING_ PATHWAY
JNK_CASCADE
MICROTUBULE_ BASED_MOVEMENT
FEEDING_BEHAVIOR
CATABOLIC_ PROCESS
BRAIN_ DEVELOPMENT
REGULATION_OF_ CELL_ PROLIFERATION
DNA_DEPENDENT_DNA_ REPLICATION
TRANSFORMING_ GROWTH_FACTOR_ BETA_RECEPTOR_ SIGNALING_ PATHWAY
STRESS_ACTIVATED_ PROTEIN_KINASE_ SIGNALING_ PATHWAY
CYTOSKELETON_ DEPENDENT_ INTRACELLULAR_ TRANSPORT
G_PROTEIN_COUPLED_ RECEPTOR_PROTEIN_ SIGNALING_ PATHWAY
CELLULAR_ CATABOLIC_ PROCESS
CENTRAL_NERVOUS_ SYSTEM_ DEVELOPMENT
DIGESTION
ESTABLISHMENT_ AND_OR_ MAINTENANCE_OF_ CELL_POLARITY
SPHINGOLIPID_ METABOLIC_ PROCESS
CYTOKINE_AND_ CHEMOKINE_ MEDIATED_ SIGNALING_ PATHWAY
REGULATION_OF_ INTRACELLULAR_ TRANSPORT
REGULATION_OF_ HEART_ CONTRACTION
MAINTENANCE_OF_ LOCALIZATION
JAK_STAT_CASCADE
EMBRYONIC_ DEVELOPMENT

**sALS top 100**




## Thursday

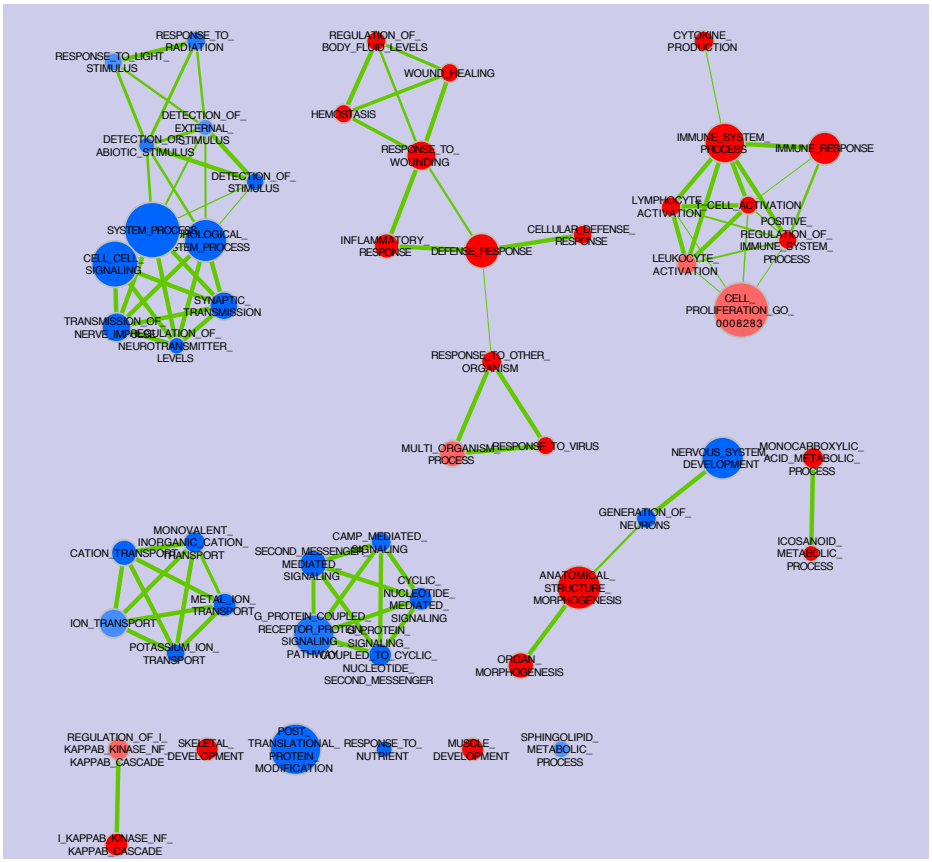
As well as GSEA, on Thursday I talked with John about the samples and he suggested I try hierarchical clustering based on the pathprint results rather than raw expression values. This was interesting because it showed how the data seems to cluster more by tissue than disease (which is expected as there is a larger signal for 'tissue type' in a cell than disease). However, within each tissue it was promising to see that the disease samples often clustered together with spread of controls



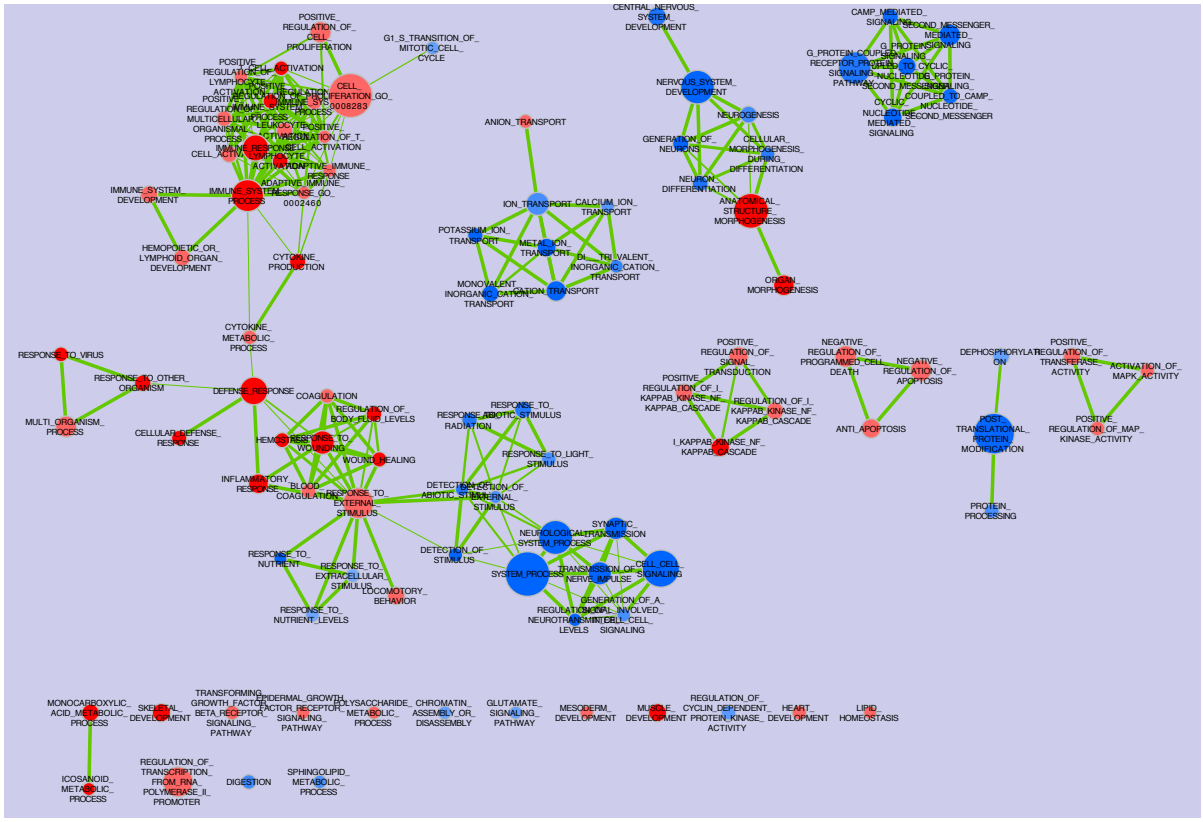

## Friday

By the end of the week I had finished the GSEA for FTLD and VCP, and the networks were thus:

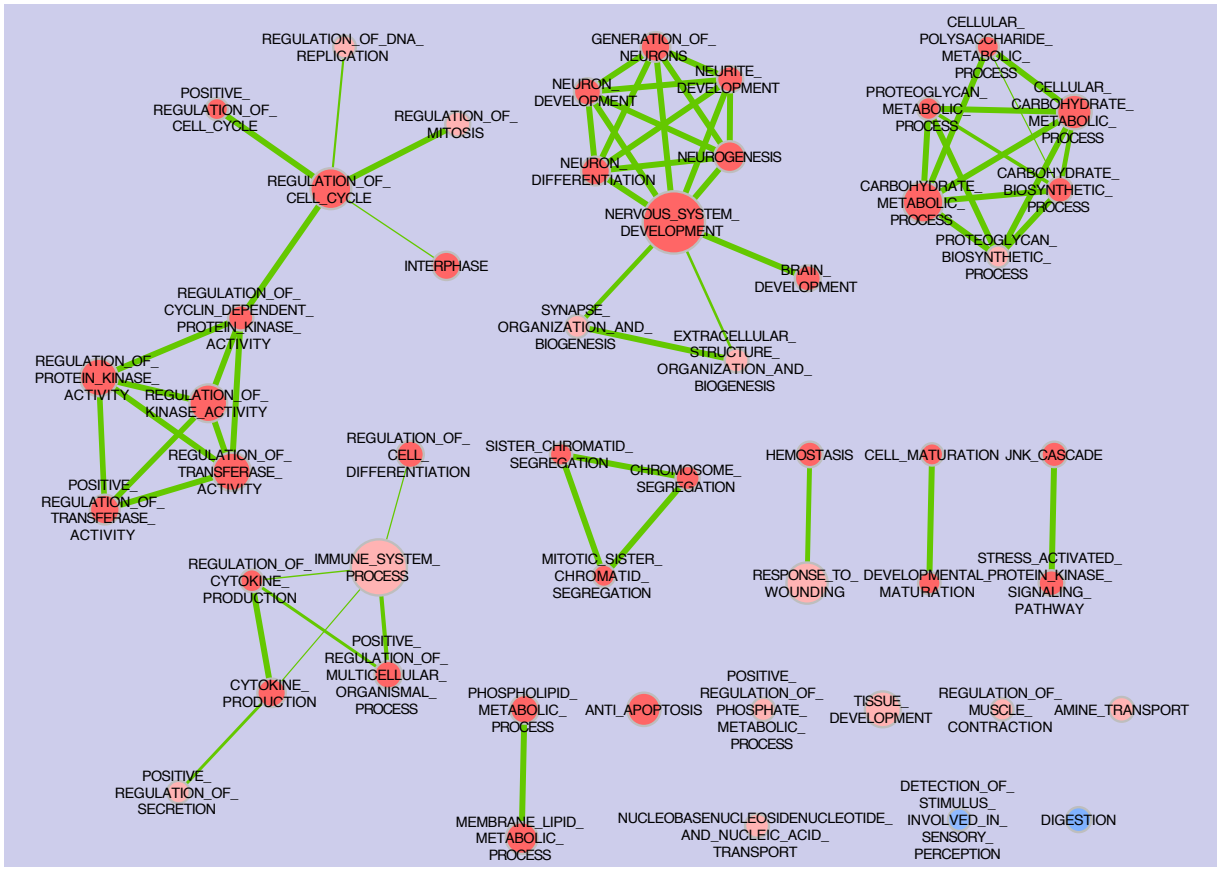
## FTLD top 50


RESPONSE_TO_
RADIATION
RESPONSE_TO_LIGHT_
STIMULUS
DETECTION_OF_
EXTERNAL_
STIMULUS
DETECTION_OF_
ABIOTIC_STIMULUS
DETECTION_OF_
STIMULUS
SYSTEM_PROCESS
CELL_CELL_
SIGNALING
SYNAPTIC_
TRANSMISSION
TRANSMISSION_OF_
NERVE_IMPULSE
REGULATION_OF_
NEUROTRANSMITTER_
LEVELS
REGULATION_OF_
BODY_FLUID_LEVELS
WOUND_HEALING
HEMOSTASIS
RESPONSE_TO_
WOUNDING
INFLAMMATORY_
RESPONSE
DEFENSE_RESPONSE
CELLULAR_DEFENSE_
RESPONSE
RESPONSE_TO_OTHER_
ORGANISM
MULTI_ORGANISM_
PROCESS
RESPONSE_TO_VIRUS
CYTOKINE_
PRODUCTION
IMMUNE_SYSTEM_
PROCESS
IMMUNE_RESPONSE
LYMPHOCYTE_
ACTIVATION
CELL_ACTIVATION
POSITIVE_
REGULATION_OF_
IMMUNE_SYSTEM_
PROCESS
LEUKOCYTE_
ACTIVATION
CELL_
PROLIFERATION_GO_
0008283
NERVOUS_SYSTEM_
DEVELOPMENT
MONOCARBOXYLIC_
ACID_METABOLIC_
PROCESS
GENERATION_OF_
NEURONS
ICOSANOID_
METABOLIC_
PROCESS
ANATOMICAL_
STRUCTURE_
MORPHOGENESIS
ORGAN_
MORPHOGENESIS
MONOVALENT_
INORGANIC_CATION_
TRANSPORT
CATION_TRANSPORT
METAL_ION_
TRANSPORT
ION_TRANSPORT
POTASSIUM_ION_
TRANSPORT
CAMP_MEDIATED_
SIGNALING
SECOND_MESSENGER_
MEDIATED_
SIGNALING
CYCLIC_
NUCLEOTIDE_
MEDIATED_
SIGNALING
G_PROTEIN_COUPLED_
RECEPTOR_PROTEIN_
SIGNALING_
PATHWAY
G_PROTEIN_
SIGNALING_
COUPLED_TO_CYCLIC_
NUCLEOTIDE_
SECOND_MESSENGER
REGULATION_OF_I_
KAPPAB_KINASE_NF_
KAPPAB_CASCADE
SKELETAL_
DEVELOPMENT
POST_
TRANSLATIONAL_
PROTEIN_
MODIFICATION
RESPONSE_TO_
NUTRIENT
MUSCLE_
DEVELOPMENT
SPHINGOLIPID_
METABOLIC_
PROCESS
I_KAPPAB_KINASE_NF_
KAPPAB_CASCADE

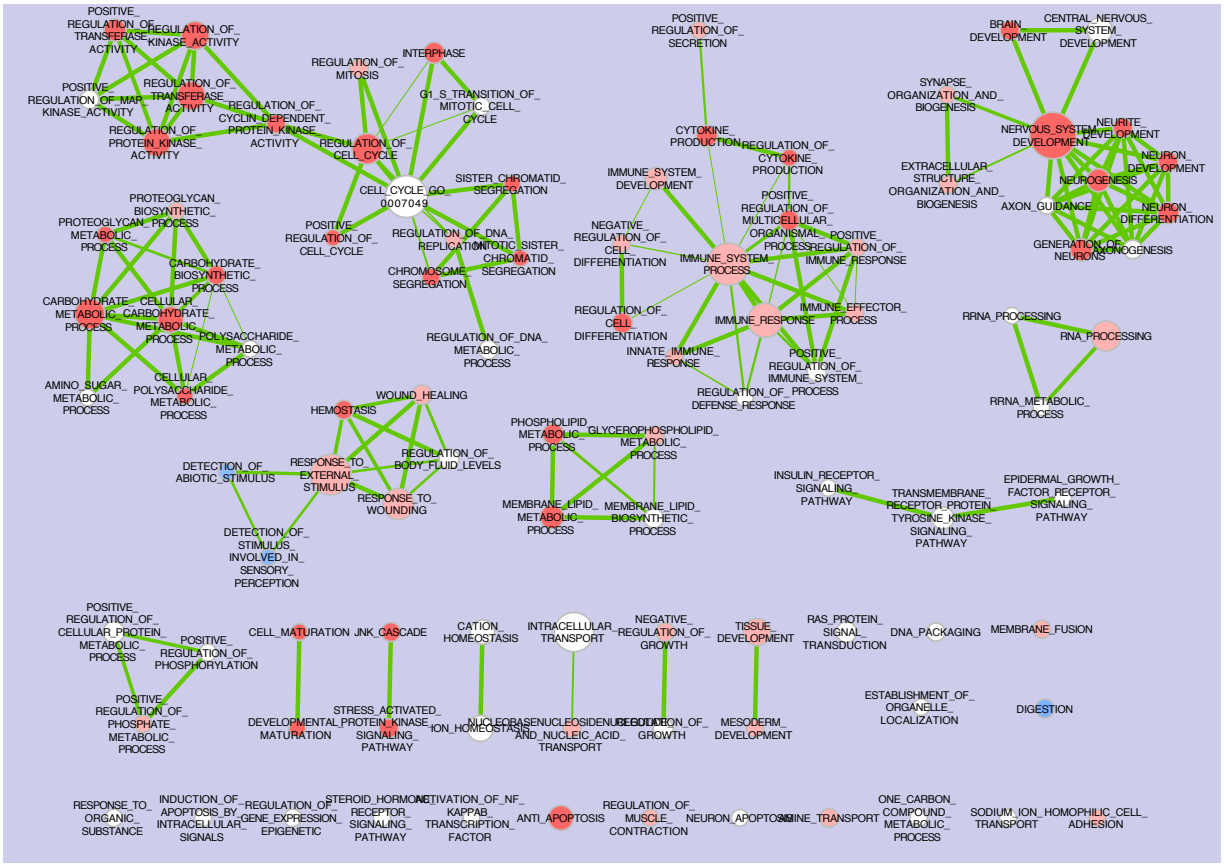
## FTLD top 100


POSITIVE_ REGULATION_OF_ CELL_ PROLIFERATION
G1_S_TRANSITION_OF_ MITOTIC_CELL_ CYCLE
POSITIVE_ REGULATION_OF_ CELL_ ACTIVATION
CELL_ PROLIFERATION_GO_ 0008283
POSITIVE_ REGULATION_OF_ LYMPHOCYTE_ ACTIVATION
REGULATION_OF_ IMMUNE_SYSTEM_ PROCESS
MULTICELLULAR_ORGANISMAL_ PROCESS
POSITIVE_ REGULATION_OF_T_ CELL_ ACTIVATION
IMMUNE_RESPONSE
CELL_ ACTIVATION
LYMPHOCYTE_ ACTIVATION
REGULATION_OF_ IMMUNE_ RESPONSE
ADAPTIVE_IMMUNE_ RESPONSE
IMMUNE_SYSTEM_ DEVELOPMENT
IMMUNE_SYSTEM_ PROCESS
ADAPTIVE_IMMUNE_ RESPONSE_GO_ 0002460
HEMOPOIETIC_OR_ LYMPHOID_ORGAN_ DEVELOPMENT
CYTOKINE_ PRODUCTION
CYTOKINE_ METABOLIC_ PROCESS
RESPONSE_TO_VIRUS
RESPONSE_TO_OTHER_ ORGANISM
DEFENSE_RESPONSE
MULTI_ORGANISM_ PROCESS
CELLULAR_DEFENSE_ RESPONSE
COAGULATION
REGULATION_OF_ BODY_FLUID_LEVELS
HEMOSTASIS
RESPONSE_TO_ WOUNDING
WOUND_HEALING
INFLAMMATORY_ RESPONSE
BLOOD_ COAGULATION
RESPONSE_TO_ EXTERNAL_ STIMULUS
ANION_TRANSPORT
ION_TRANSPORT
CALCIUM_ION_ TRANSPORT
POTASSIUM_ION_ TRANSPORT
METAL_ION_ TRANSPORT
DI_ TRIVALENT_ INORGANIC_CATION_ TRANSPORT
MONOVALENT_ INORGANIC_CATION_ TRANSPORT
CENTRAL_NERVOUS_ SYSTEM_ DEVELOPMENT
NERVOUS_SYSTEM_ DEVELOPMENT
NEUROGENESIS
GENERATION_OF_ NEURONS
CELLULAR_ MORPHOGENESIS_ DURING_ DIFFERENTIATION
NEURON_ DIFFERENTIATION
ANATOMICAL_ STRUCTURE_ MORPHOGENESIS
ORGAN_ MORPHOGENESIS
CAMP_MEDIATED_ SIGNALING
SECOND_MESSENGER_ MEDIATED_ SIGNALING
G_PROTEIN_COUPLED_ RECEPTOR_PROTEIN_ SIGNALING_ PATHWAY
G_PROTEIN_SIGNALING_ COUPLED_TO_ CYCLIC_ NUCLEOTIDE_ SECOND_MESSENGER
CYCLIC_ NUCLEOTIDE_ MEDIATED_ SIGNALING
G_PROTEIN_SIGNALING_ COUPLED_TO_CAMP_ SECOND_MESSENGER
POSITIVE_ REGULATION_OF_ SIGNAL_ TRANSDUCTION
POSITIVE_ REGULATION_OF_I_ KAPPAB_KINASE_NF_ KAPPAB_CASCADE
REGULATION_OF_I_ KAPPAB_KINASE_NF_ KAPPAB_CASCADE
I_KAPPAB_KINASE_NF_ KAPPAB_CASCADE
NEGATIVE_ REGULATION_OF_ PROGRAMMED_CELL_ DEATH
NEGATIVE_ REGULATION_OF_ APOPTOSIS
ANTI_APOPTOSIS
DEPHOSPHORYLATION
POST_ TRANSLATIONAL_ PROTEIN_ MODIFICATION
PROTEIN_ PROCESSING
POSITIVE_ REGULATION_OF_ TRANSFERASE_ ACTIVITY
ACTIVATION_OF_ MAPK_ACTIVITY
POSITIVE_ REGULATION_OF_MAP_ KINASE_ACTIVITY
RESPONSE_TO_ ABIOTIC_STIMULUS
RESPONSE_TO_ RADIATION
RESPONSE_TO_LIGHT_ STIMULUS
DETECTION_OF_ ABIOTIC_STIMULUS
DETECTION_OF_ EXTERNAL_ STIMULUS
DETECTION_OF_ STIMULUS
SYNAPTIC_ TRANSMISSION
NEUROLOGICAL_ SYSTEM_PROCESS
SYSTEM_PROCESS
CELL_CELL_ SIGNALING
TRANSMISSION_OF_ NERVE_IMPULSE
GENERATION_OF_A_ MOL_INVOLVED_ CELL_CELL_ SIGNALING
REGULATION_OF_ NEUROTRANSMITTER_ LEVELS
RESPONSE_TO_ NUTRIENT
RESPONSE_TO_ EXTRACELLULAR_ STIMULUS
LOCOMOTORY_ BEHAVIOR
RESPONSE_TO_ NUTRIENT_LEVELS
MONOCARBOXYLIC_ ACID_METABOLIC_ PROCESS
SKELETAL_ DEVELOPMENT
TRANSFORMING_ GROWTH_FACTOR_ BETA_RECEPTOR_ SIGNALING_ PATHWAY
EPIDERMAL_GROWTH_ FACTOR_RECEPTOR_ SIGNALING_ PATHWAY
POLYSACCHARIDE_ METABOLIC_ PROCESS
CHROMATIN_ ASSEMBLY_OR_ DISASSEMBLY
GLUTAMATE_ SIGNALING_ PATHWAY
MESODERM_ DEVELOPMENT
MUSCLE_ DEVELOPMENT
REGULATION_OF_ CYCLIN_DEPENDENT_ PROTEIN_KINASE_ ACTIVITY
HEART_ DEVELOPMENT
LIPID_ HOMEOSTASIS
ICOSANOID_ METABOLIC_ PROCESS
REGULATION_OF_ TRANSCRIPTION_ FROM_RNA_ POLYMERASE_II_ PROMOTER
DIGESTION
SPHINGOLIPID_ METABOLIC_ PROCESS

**VCP top 50**


REGULATION_OF_DNA_REPLICATION
POSITIVE_REGULATION_OF_CELL_CYCLE
REGULATION_OF_MITOSIS
REGULATION_OF_CELL_CYCLE
INTERPHASE
REGULATION_OF_CYCLIN_DEPENDENT_PROTEIN_KINASE_ACTIVITY
REGULATION_OF_PROTEIN_KINASE_ACTIVITY
REGULATION_OF_KINASE_ACTIVITY
REGULATION_OF_TRANSFERASE_ACTIVITY
POSITIVE_REGULATION_OF_TRANSFERASE_ACTIVITY
GENERATION_OF_NEURONS
NEURITE_DEVELOPMENT
NEURON_DEVELOPMENT
NEUROGENESIS
NEURON_DIFFERENTIATION
NERVOUS_SYSTEM_DEVELOPMENT
BRAIN_DEVELOPMENT
SYNAPSE_ORGANIZATION_AND_BIOGENESIS
EXTRACELLULAR_STRUCTURE_ORGANIZATION_AND_BIOGENESIS
CELLULAR_POLYSACCHARIDE_METABOLIC_PROCESS
PROTEOGLYCAN_METABOLIC_PROCESS
CELLULAR_CARBOHYDRATE_METABOLIC_PROCESS
CARBOHYDRATE_METABOLIC_PROCESS
CARBOHYDRATE_BIOSYNTHETIC_PROCESS
PROTEOGLYCAN_BIOSYNTHETIC_PROCESS
REGULATION_OF_CELL_DIFFERENTIATION
SISTER_CHROMATID_SEGREGATION
CHROMOSOME_SEGREGATION
MITOTIC_SISTER_CHROMATID_SEGREGATION
HEMOSTASIS
RESPONSE_TO_WOUNDING
CELL_MATURATION
DEVELOPMENTAL_MATURATION
JNK_CASCADE
STRESS_ACTIVATED_PROTEIN_KINASE_SIGNALING_PATHWAY
REGULATION_OF_CYTOKINE_PRODUCTION
IMMUNE_SYSTEM_PROCESS
CYTOKINE_PRODUCTION
POSITIVE_REGULATION_OF_MULTICELLULAR_ORGANISMAL_PROCESS
POSITIVE_REGULATION_OF_SECRETION
PHOSPHOLIPID_METABOLIC_PROCESS
ANTI_APOPTOSIS
POSITIVE_REGULATION_OF_PHOSPHATE_METABOLIC_PROCESS
TISSUE_DEVELOPMENT
REGULATION_OF_MUSCLE_CONTRACTION
AMINE_TRANSPORT
MEMBRANE_LIPID_METABOLIC_PROCESS
NUCLEOBASENUCLEOSIDENUCLEOTIDE_AND_NUCLEIC_ACID_TRANSPORT
DETECTION_OF_STIMULUS_INVOLVED_IN_SENSORY_PERCEPTION
DIGESTION

## VCP top 100


POSITIVE_ REGULATION_OF_ TRANSFERASE_ ACTIVITY
REGULATION_OF_ KINASE_ACTIVITY
POSITIVE_ REGULATION_OF_MAP_ KINASE_ACTIVITY
REGULATION_OF_ TRANSFERASE_ ACTIVITY
REGULATION_OF_ PROTEIN_KINASE_ ACTIVITY
REGULATION_OF_ CYCLIN_DEPENDENT_ PROTEIN_KINASE_ ACTIVITY
REGULATION_OF_ MITOSIS
INTERPHASE
G1_S_TRANSITION_OF_ MITOTIC_CELL_ CYCLE
REGULATION_OF_ CELL_CYCLE
CELL_CYCLE_GO_ 0007049
SISTER_CHROMATID_ SEGREGATION
POSITIVE_ REGULATION_OF_ CELL_CYCLE
REGULATION_OF_DNA_ REPLICATION
MITOTIC_SISTER_ CHROMATID_ SEGREGATION
CHROMOSOME_ SEGREGATION
REGULATION_OF_DNA_ METABOLIC_ PROCESS
PROTEOGLYCAN_ BIOSYNTHETIC_ PROCESS
PROTEOGLYCAN_ METABOLIC_ PROCESS
CARBOHYDRATE_ BIOSYNTHETIC_ PROCESS
CARBOHYDRATE_ METABOLIC_ PROCESS
CELLULAR_ CARBOHYDRATE_ METABOLIC_ PROCESS
POLYSACCHARIDE_ METABOLIC_ PROCESS
AMINO_SUGAR_ METABOLIC_ PROCESS
CELLULAR_ POLYSACCHARIDE_ METABOLIC_ PROCESS
WOUND_HEALING
HEMOSTASIS
REGULATION_OF_ BODY_FLUID_LEVELS
DETECTION_OF_ ABIOTIC_STIMULUS
RESPONSE_TO_ EXTERNAL_ STIMULUS
RESPONSE_TO_ WOUNDING
DETECTION_OF_ STIMULUS_ INVOLVED_IN_ SENSORY_ PERCEPTION
POSITIVE_ REGULATION_OF_ SECRETION
CYTOKINE_ PRODUCTION
REGULATION_OF_ CYTOKINE_ PRODUCTION
IMMUNE_SYSTEM_ DEVELOPMENT
POSITIVE_ REGULATION_OF_ MULTICELLULAR_ ORGANISMAL_ PROCESS
NEGATIVE_ REGULATION_OF_ CELL_ DIFFERENTIATION
IMMUNE_SYSTEM_ PROCESS
POSITIVE_ REGULATION_OF_ IMMUNE_RESPONSE
REGULATION_OF_ CELL_ DIFFERENTIATION
IMMUNE_EFFECTOR_ PROCESS
IMMUNE_RESPONSE
INNATE_IMMUNE_ RESPONSE
POSITIVE_ REGULATION_OF_ IMMUNE_SYSTEM_ PROCESS
REGULATION_OF_ DEFENSE_RESPONSE
BRAIN_ DEVELOPMENT
CENTRAL_NERVOUS_ SYSTEM_ DEVELOPMENT
SYNAPSE_ ORGANIZATION_AND_ BIOGENESIS
NERVOUS_SYSTEM_ DEVELOPMENT
NEURITE_ DEVELOPMENT
NEURON_ DEVELOPMENT
EXTRACELLULAR_ STRUCTURE_ ORGANIZATION_AND_ BIOGENESIS
NEUROGENESIS
AXON_GUIDANCE
NEURON_ DIFFERENTIATION
GENERATION_OF_ NEURONS
GLIOGENESIS
RRNA_PROCESSING
RNA_PROCESSING
RRNA_METABOLIC_ PROCESS
PHOSPHOLIPID_ METABOLIC_ PROCESS
GLYCEROPHOSPHOLIPID_ METABOLIC_ PROCESS
MEMBRANE_LIPID_ METABOLIC_ PROCESS
MEMBRANE_LIPID_ BIOSYNTHETIC_ PROCESS
INSULIN_RECEPTOR_ SIGNALING_ PATHWAY
TRANSMEMBRANE_ RECEPTOR_PROTEIN_ TYROSINE_KINASE_ SIGNALING_ PATHWAY
EPIDERMAL_GROWTH_ FACTOR_RECEPTOR_ SIGNALING_ PATHWAY
POSITIVE_ REGULATION_OF_ CELLULAR_PROTEIN_ METABOLIC_ PROCESS
POSITIVE_ REGULATION_OF_ PHOSPHORYLATION
POSITIVE_ REGULATION_OF_ PHOSPHATE_ METABOLIC_ PROCESS
CELL_MATURATION
JNK_CASCADE
CATION_ HOMEOSTASIS
INTRACELLULAR_ TRANSPORT
NEGATIVE_ REGULATION_OF_ GROWTH
TISSUE_ DEVELOPMENT
RAS_PROTEIN_ SIGNAL_ TRANSDUCTION
DNA_PACKAGING
MEMBRANE_FUSION
ESTABLISHMENT_OF_ ORGANELLE_ LOCALIZATION
DIGESTION
DEVELOPMENTAL_ MATURATION
STRESS_ACTIVATED_ PROTEIN_KINASE_ SIGNALING_ PATHWAY
ION_HOMEOSTASIS
NUCLEOBASE_ AND_NUCLEIC_ACID_ TRANSPORT
REGULATION_OF_ GROWTH
MESODERM_ DEVELOPMENT
RESPONSE_TO_ ORGANIC_ SUBSTANCE
INDUCTION_OF_ APOPTOSIS_BY_ INTRACELLULAR_ SIGNALS
REGULATION_OF_ GENE_EXPRESSION_ EPIGENETIC
STEROID_HORMONE_ RECEPTOR_ SIGNALING_ PATHWAY
ACTIVATION_OF_NF_ KAPPAB_ TRANSCRIPTION_ FACTOR
ANTI_APOPTOSIS
REGULATION_OF_ MUSCLE_ CONTRACTION
NEURON_APOPTOSIS
ONE_CARBON_ COMPOUND_ METABOLIC_ PROCESS
SODIUM_ION_ TRANSPORT
HOMOPHILIC_CELL_ ADHESION