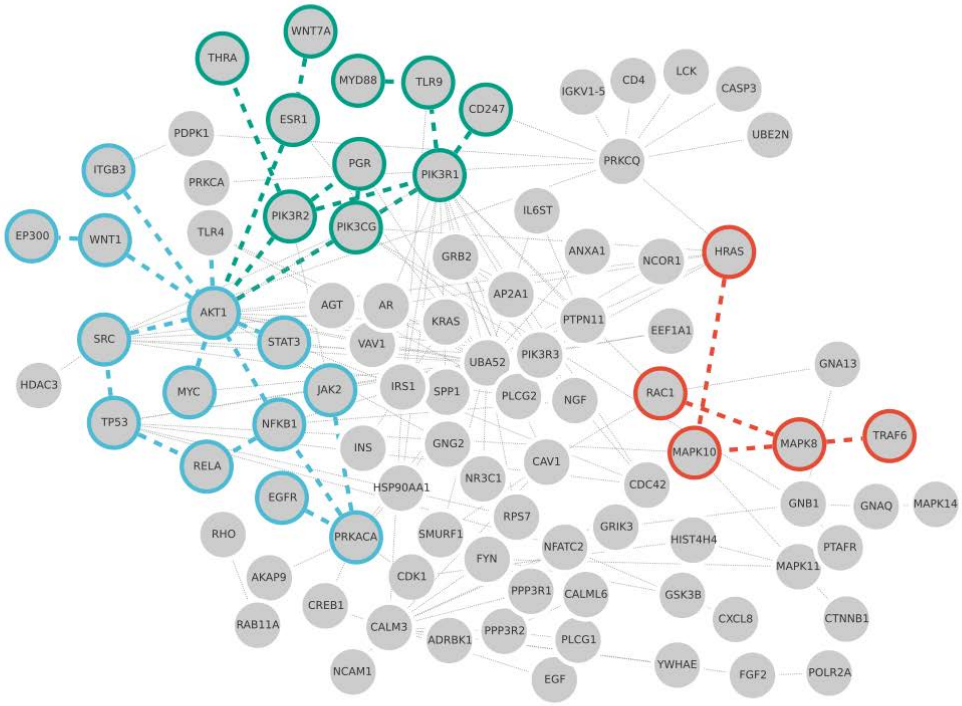

Figure S1. Whole reconstructed graph of the input microarray data set using an edge_repetition of 6.

	Pathways	**Cluster Score**
1	GWAS:Obesity, GWAS:Overnutrition	9.977136515
2	GO:0000279 M phase, GO:0000278 mitotic cell cycle, GO:0000280 nuclear division, GO:0000087 M phase of mitotic cell cycle	4.24853957
3	9606: GPCR ligand binding, 9606: Class A/1 (Rhodopsin-like receptors), 9606: Peptide ligand-binding receptors, 9606: Chemokine receptors bind chemokines, Peptide GPCRs%WikiPathways_20160311%WP24%Homo sapiens, 9606: Inflammation mediated by chemokine and cytokine signaling pathway, hsa04062 Chemokine signaling pathway	3.843723098
4	9606: Centrosome maturation, 9606: Loss of Nlp from mitotic centrosomes, 9606: Loss of proteins required for interphase microtubule organizationÂ from the centrosome, 9606: Recruitment of mitotic centrosome proteins and complexes, 9606: Regulation of PLK1 Activity at G2/M Transition, 9606: G2/M Transition, 9606: Mitotic G2-G2/M phases	3.707262361
5	GO:0006082 organic acid metabolic process, GO:0006519 cellular amino acid and derivative metabolic process, GO:0006520 amino acid metabolic process	3.625390887
6	OMIM:Deficiency Diseases, OMIM:Nutrition Disorders, OMIM:Malnutrition	3.571941355
7	9606: Amine ligand-binding receptors, Calcium Regulation in the Cardiac Cell%WikiPathways_20160311%WP536%Homo sapiens, Myometrial Relaxation and Contraction Pathways%WikiPathways_20160311%WP289%Homo sapiens, Monoamine GPCRs%WikiPathways_20160311%WP58%Homo sapiens, 9606: Alzheimer disease-amyloid secretase pathway, 9606: Heterotrimeric G-protein signaling pathway-Gi alpha and Gs alpha mediated pathway, 9606: Heterotrimeric G-protein signaling pathway-Gq alpha and Go alpha mediated pathway, hsa04020 Calcium signaling pathway, hsa04970 Salivary secretion, hsa04270 Vascular smooth muscle contraction	3.535638528
8	Endothelins, 9606: Ca-dependent events, 9606: CaM pathway, 9606: Calmodulin induced events, 9606: PLCG1 events in ERBB2 signaling, 9606: DAG and IP3 signaling, 9606: EGFR interacts with phospholipase C-gamma, 9606: Glucagon signaling in metabolic regulation, 9606: G-protein mediated events, 9606: PLC beta mediated events, 9606: PLC-gamma1 signalling, 9606: Glucagon-like Peptide-1 (GLP1) regulates insulin secretion, 9606: Signaling by Hedgehog, 9606: Hedgehog 'off' state, 9606: Vasopressin regulates renal water homeostasis via Aquaporins, 9606: Aquaporin-mediated transport, 9606: Activation of GABAB receptors, 9606: GABA B receptor activation, 9606: Opioid Signalling, 9606: Regulation of insulin secretion, 9606: Integration of energy metabolism, 9606: untitled, 9606: GABA-B_receptor_II_signaling, hsa04114 Oocyte meiosis, hsa04914 Progesterone-mediated oocyte maturation, hsa00230 Purine metabolism	3.504156556
9	Posttranslational regulation of adherens junction stability and dissassembly, 9606: Signaling by SCF-KIT, 9606: Signaling by ERBB4, 9606: Role of LAT2/NTAL/LAB on calcium mobilization, 9606: PI3K/AKT activation, 9606: GAB1 signalosome, 9606: PI-3K cascade, 9606: PI3K events in ERBB2 signaling, 9606: PI3K events in ERBB4 signaling, 9606: PI3K/AKT Signaling in Cancer, 9606: PIP3 activates AKT signaling, 9606: Constitutive PI3K/AKT Signaling in Cancer, 9606: Signaling by Insulin receptor, 9606: IGF1R signaling cascade, 9606: IRS-related events triggered by IGF1R, 9606: Signaling by Type 1 Insulin-like Growth Factor 1 Receptor (IGF1R), 9606: IRS-related events, 9606: Insulin receptor signalling cascade, 9606: IRS-mediated signalling, 9606: PI3K Cascade, 9606: Signaling by FGFR mutants, 9606: Signaling by FGFR1 mutants, 9606: FRS2-mediated cascade, 9606: Phospholipase C-mediated cascade, Mecp2 and Associated Rett Syndrome%WikiPathways_20160311%WP3584%Homo sapiens, Differentiation Pathway%WikiPathways_20160311%WP2848%Homo sapiens, 9606: FGF signaling pathway	3.38059273
10	9606: Transmembrane transport of small molecules, 9606: GABA receptor activation, 9606: Ion channel transport, 9606: Transmission across Chemical Synapses, 9606: GABA A receptor activation, 9606: Ligand-gated ion channel transport, 9606: Neurotransmitter Receptor Binding And Downstream Transmission In The Postsynaptic Cell, 9606: Orphan transporters, 9606: Stimuli-sensing channels, 9606: Neuronal System	3.364161521

11	GO:0001944 vasculature development, GO:0001568 blood vessel development, GO:0001525 angiogenesis	3.351540968
12	GWAS:Myocardial Ischemia, GWAS:Atherosclerosis, GWAS:Coronary Arteriosclerosis, GWAS:Coronary Artery Disease, GWAS:Coronary heart disease, GWAS:Arteriosclerosis	3.310331642
13	GWAS:Senile dementia, GWAS:Alzheimers Disease Pathway Kegg, GWAS:Alzheimers Disease, GWAS:Tauopathies	3.231845041
14	9606: Keratan sulfate biosynthesis, 9606: Keratan sulfate/keratin metabolism	3.209979798
15	9606: Gap junction trafficking, 9606: Gap junction trafficking and regulation, hsa04144 Endocytosis, hsa04142 Lysosome, GO:0006022 aminoglycan metabolic process	3.208553019
16	GO:0002520 immune system development, GO:0002376 immune system process, GO:0002521 leukocyte differentiation, GO:0002694 regulation of leukocyte activation, GO:0001817 regulation of cytokine production, GO:0002683 negative regulation of immune system process, GO:0001775 cell activation	3.198337509
17	OMIM:Lupus Erythematosus, Systemic, GWAS:Lupus Erythematosus, 9606: Fcgamma receptor (FCGR) dependent phagocytosis, 9606: Role of phospholipids in phagocytosis, hsa00500 Starch and sucrose metabolism	3.150958049
18	9606: Signaling by NOTCH, 9606: HATs acetylate histones, 9606: Factors involved in megakaryocyte development and platelet production, SIDS Susceptibility Pathways%WikiPathways_20160311%WP706%Homo sapiens, Integrated Pancreatic Cancer Pathway%WikiPathways_20160311%WP2377%Homo sapiens, Integrated Breast Cancer Pathway%WikiPathways_20160311%WP1984%Homo sapiens, Wnt Signaling Pathway and Pluripotency%WikiPathways_20160311%WP399%Homo sapiens, Cell Cycle%WikiPathways_20160311%WP179%Homo sapiens, TGF-beta Receptor Signaling%WikiPathways_20160311%WP560%Homo sapiens, Androgen receptor signaling pathway%WikiPathways_20160311%WP138%Homo sapiens, TGF-beta Signaling Pathway%WikiPathways_20160311%WP366%Homo sapiens, 9606: Huntington disease, 9606: TGF-beta signaling pathway, 9606: p53 pathway, hsa04110 Cell cycle, hsa04310 Wnt signaling pathway, GO:0001666 response to hypoxia	3.112333504
19	OMIM:Hemoglobinopathies, GWAS:Anemia, Hemolytic, Congenital, 9606: Ion transport by P-type ATPases, GO:0006163 purine nucleotide metabolic process, GO:0006164 purine nucleotide biosynthetic process	3.108867626
20	GWAS:Gastrointestinal carcinoma, 9606: G alpha (s) signalling events, 9606: Platelet homeostasis, 9606: Class B/2 (Secretin family receptors), 9606: Neurotransmitter Release Cycle, 9606: Amino acid and derivative metabolism, 9606: Phospholipid metabolism, Circadian rythm related genes%WikiPathways_20160311%WP3594%Homo sapiens, GPCRs, Other%WikiPathways_20160311%WP117%Homo sapiens, Synaptic Vesicle Pathway%WikiPathways_20160311%WP2267%Homo sapiens, Wnt Signaling Pathway%WikiPathways_20160311%WP428%Homo sapiens, Endothelin Pathways%WikiPathways_20160311%WP2197%Homo sapiens, TSH signaling pathway%WikiPathways_20160311%WP2032%Homo sapiens, 9606: Alzheimer disease-presenilin pathway, 9606: Nicotinic acetylcholine receptor signaling pathway, 9606: PNAT, 9606:5HT1 type receptor mediated signaling pathway, 9606: Muscarinic acetylcholine receptor 2 and 4 signaling pathway, 9606: Nicotine pharmacodynamics pathway, hsa04730 Long-term depression, GO:0006066 cellular alcohol metabolic process, GO:0003015 heart process, GO:0003001 generation of a signal involved in cell-cell signaling, GO:0001505 regulation of neurotransmitter levels, GO:0006470 protein amino acid dephosphorylation, GO:0003012 muscle system process, GO:0001508 regulation of action potential, GO:0003018 vascular process in circulatory system	3.092329208
21	BIOCARTA_CREB_PATHWAY, Glucocorticoid receptor regulatory network, DNA Damage Response%WikiPathways_20160311%WP707%Homo sapiens, G1 to S cell cycle control%WikiPathways_20160311%WP45%Homo sapiens, miRNA Regulation of DNA Damage Response%WikiPathways_20160311%WP1530%Homo sapiens, Interleukin-11 Signaling Pathway%WikiPathways_20160311%WP2332%Homo sapiens, hsa04612 Antigen processing and presentation	3.085922356
22	9606: Signaling by Wnt, 9606: Signaling by WNT in cancer, 9606: RNF mutants show	3.06928495

	enhanced WNT signaling and proliferation, 9606: XAV939 inhibits tankyrase, stabilizing AXIN, 9606: misspliced LRP5 mutants have enhanced beta-catenin-dependent signaling, 9606: TCF dependent signaling in response to WNT	4
23	9606: Axon guidance, 9606: Developmental Biology, hsa04360 Axon guidance	3.064079467
24	BIOCARTA_NFAT_PATHWAY, IL2-mediated signaling events, IL3-mediated signaling events, BDNF signaling pathway%WikiPathways_20160311%WP2380%Homo sapiens, Cardiac Hypertrophic Response%WikiPathways_20160311%WP2795%Homo sapiens, MicroRNAs in cardiomyocyte hypertrophy%WikiPathways_20160311%WP1544%Homo sapiens, 9606: B cell activation, GO:0006468 protein amino acid phosphorylation, GO:0006464 protein modification process, GO:0000165 MAPKKK cascade, GO:0000187 activation of MAPK activity	3.037083743
25	9606: Cell-Cell communication, 9606: Cell junction organization, 9606: Signaling by VEGF, 9606: Cell-cell junction organization, 9606: VEGFA-VEGFR2 Pathway, 9606: Wnt signaling pathway, 9606: Cadherin signaling pathway, hsa04670 Leukocyte transendothelial migration	3.024470797
26	GWAS:Urologic Neoplasms, GWAS:Malignant Neoplasm Of Urinary Organ, Unspecified, GO:0006091 generation of precursor metabolites and energy, GO:0006486 protein amino acid glycosylation, GO:0005996 monosaccharide metabolic process, GO:0006006 glucose metabolic process	2.993196039
27	FAS (CD95) signaling pathway, 9606: Voltage gated Potassium channels, 9606: Downstream TCR signaling, 9606: Antigen activates B Cell Receptor (BCR) leading to generation of second messengers, 9606: Amino acid and oligopeptide SLC transporters, 9606: Na+/Cl- dependent neurotransmitter transporters, 9606: Amine compound SLC transporters, 9606: Transport of glucose and other sugars, bile salts and organic acids, metal ions and amine compounds, Endoderm Differentiation%WikiPathways_20160311%WP2853%Homo sapiens, 9606:5HT2 type receptor mediated signaling pathway, 9606: Metabotropic glutamate receptor group III pathway, hsa04115 p53 signaling pathway	2.987187868
28	GWAS:Nervous System Sclerosis, GWAS:Demyelinating Autoimmune Diseases, Cns, GWAS:Atopy, GWAS:Respiratory Hypersensitivity	2.975740999
29	IL4-mediated signaling events, IL23-mediated signaling events, Notch-mediated HESHEY network, OMIM:Adrenal Gland Diseases, GWAS:Abnormal degeneration, OMIM:Malignant neoplasm of prostate, GWAS:Age Related Macular Degeneration, GWAS:Non Arthropod Borne Viral Diseases Of The Central Nervous System, OMIM:Cataract, GWAS:Chronic Kidney Diseases, GWAS:Chronic disease, 9606: Immunoregulatory interactions between a Lymphoid and a non-Lymphoid cell, 9606: Adaptive Immune System, 9606: Degradation of the extracellular matrix, 9606: L1CAM interactions, 9606: TCR signaling, 9606: Class I MHC mediated antigen processing & presentation, 9606: Meiosis, 9606: HIV Infection, 9606: Metabolism of proteins, 9606: Asparagine N-linked glycosylation, 9606: Inwardly rectifying K+ channels, 9606: Interferon alpha/beta signaling, 9606: HDACs deacetylate histones, 9606: Interferon gamma signaling, 9606: Nuclear Receptor transcription pathway, 9606: ECM proteoglycans, 9606: Olfactory Signaling Pathway, Ectoderm Differentiation%WikiPathways_20160311%WP2858%Homo sapiens, Spinal Cord Injury%WikiPathways_20160311%WP2431%Homo sapiens, Integrated Cancer Pathway%WikiPathways_20160311%WP1971%Homo sapiens, Allograft Rejection%WikiPathways_20160311%WP2328%Homo sapiens, Copper homeostasis%WikiPathways_20160311%WP3286%Homo sapiens, Hair Follicle Development: Induction (Part 1 of 3)%WikiPathways_20160311%WP2804%Homo sapiens, NRF2 pathway%WikiPathways_20160311%WP2884%Homo sapiens, Endochondral Ossification%WikiPathways_20160311%WP474%Homo sapiens, Ovarian Infertility Genes%WikiPathways_20160311%WP34%Homo sapiens, Hematopoietic Stem Cell Differentiation%WikiPathways_20160311%WP2849%Homo sapiens, 9606: PDGF signaling pathway, 9606: Ionotropic glutamate receptor pathway, 9606: Cytoskeletal regulation by Rho GTPase, hsa04120 Ubiquitin mediated proteolysis, hsa04514 Cell adhesion molecules (CAMs), hsa00590 Arachidonic acid metabolism, hsa04260 Cardiac muscle contraction, hsa04623 Cytosolic DNA-sensing pathway, hsa04740 Olfactory transduction, hsa00983 Drug metabolism - other enzymes, hsa00510 N-Glycan biosynthesis, hsa00600 Sphingolipid metabolism, hsa04622 RIG-I-like receptor signaling pathway, hsa04380 Osteoclast	2.971869039

	differentiation, hsa04650 Natural killer cell mediated cytotoxicity, GO:0003002 regionalization, GO:0003006 reproductive developmental process, GO:0001558 regulation of cell growth, GO:0000122 negative regulation of transcription from RNA polymerase II promoter, GO:0006310 DNA recombination, GO:0000902 cell morphogenesis, GO:0006511 ubiquitin-dependent protein catabolic process, GO:0002696 positive regulation of leukocyte activation, GO:0001894 tissue homeostasis, GO:0000226 microtubule cytoskeleton organization, GO:0001890 placenta development, GO:0001654 eye development, GO:0001649 osteoblast differentiation, GO:0006352 transcription initiation, GO:0002274 myeloid leukocyte activation, GO:0006366 transcription from RNA polymerase II promoter, GO:0006457 protein folding, GO:0006397 mRNA processing, GO:0001503 ossification	
30	Heart Development%WikiPathways_20160311%WP1591%Homo sapiens, Dopaminergic Neurogenesis%WikiPathways_20160311%WP2855%Homo sapiens, Mesodermal Commitment Pathway%WikiPathways_20160311%WP2857%Homo sapiens, Neural Crest Differentiation%WikiPathways_20160311%WP2064%Homo sapiens	2.934742574
31	9606: Biological oxidations, 9606: Fatty acid, triacylglycerol, and ketone body metabolism, 9606: Metabolism, 9606: Metabolism of lipids and lipoproteins, Oxidation by Cytochrome P450%WikiPathways_20160311%WP43%Homo sapiens, Metapathway biotransformation%WikiPathways_20160311%WP702%Homo sapiens, hsa00982 Drug metabolism - cytochrome P450, hsa00980 Metabolism of xenobiotics by cytochrome P450	2.928230152
32	9606: Cellular responses to stress, 9606: Cellular Senescence, GO:0006259 DNA metabolic process, GO:0006325 establishment or maintenance of chromatin architecture, GO:0006281 DNA repair, GO:0006260 DNA replication, GO:0006323 DNA packaging, GO:0006333 chromatin assembly or disassembly	2.906079559
33	GWAS:Biliary Tract Diseases, 9606: Metabolism of RNA, 9606: SLC-mediated transmembrane transport, 9606: Processing of Capped Intron-Containing Pre-mRNA, 9606: Transport of inorganic cations/anions and amino acids/oligopeptides, GO:0006412 translation, GO:0006417 regulation of translation	2.881717229
34	GO:0002682 regulation of immune system process, GO:0002684 positive regulation of immune system process, GO:0002252 immune effector process, GO:0002443 leukocyte mediated immunity, GO:0002449 lymphocyte mediated immunity, GO:0002526 acute inflammatory response, GO:0002697 regulation of immune effector process, GO:0002250 adaptive immune response, GO:0002460 adaptive immune response based on somatic recombination of immune receptors built from immunoglobulin superfamily domains, GO:0002706 regulation of lymphocyte mediated immunity, GO:0002703 regulation of leukocyte mediated immunity	2.875265918
35	9606: GPVI-mediated activation cascade, 9606: G-protein beta:gammasignalling, 9606: G beta:gammasignalling through PI3Kgamma, Regulation of toll-like receptor signaling pathway%WikiPathways_20160311%WP1449%Homo sapiens, Toll-like Receptor Signaling Pathway%WikiPathways_20160311%WP75%Homo sapiens, 9606: p53 pathway feedback loops 2, hsa04620 Toll-like receptor signaling pathway, hsa04210 Apoptosis, hsa04664 Fc epsilon RI signaling pathway, hsa04660 T cell receptor signaling pathway	2.874280251
36	9606: Costimulation by the CD28 family, 9606: Apoptosis, 9606: Regulation of gene expression in beta cells, 9606: Regulation of beta-cell development, MAPK Signaling Pathway%WikiPathways_20160311%WP382%Homo sapiens, DNA Damage Response (only ATM dependent)%WikiPathways_20160311%WP710%Homo sapiens, Insulin Signaling%WikiPathways_20160311%WP481%Homo sapiens, Apoptosis%WikiPathways_20160311%WP254%Homo sapiens, Signaling Pathways in Glioblastoma%WikiPathways_20160311%WP2261%Homo sapiens, AMPK Signaling%WikiPathways_20160311%WP1403%Homo sapiens, 9606: Angiogenesis, 9606: T cell activation, 9606: Apoptosis signaling pathway, 9606: EGF receptor signaling pathway, 9606: Interleukin signaling pathway, hsa04910 Insulin signaling pathway, hsa04722 Neurotrophin signaling pathway, hsa04530 Tight junction	2.867697896
37	9606: Signaling by Interleukins, 9606: Interleukin-3, 5 and GM-CSF signaling, 9606: Interleukin-2 signaling	2.826156955
38	9606: Collagen formation, 9606: Collagen biosynthesis and modifying enzymes, 9606: NCAM signaling for neurite out-growth, Focal	2.801836514

	Adhesion%WikiPathways_20160311%WP306%Homo sapiens, 9606: Integrin signalling pathway, hsa04510 Focal adhesion, hsa04974 Protein digestion and absorption	
39	9606: Synthesis of PIPs at the plasma membrane, 9606: PI Metabolism, 9606: Effects of PIP2 hydrolysis, hsa04070 Phosphatidylinositol signaling system	2.766490342
40	BIOCARTA_ALK_PATHWAY, AP-1 transcription factor network, 9606: Toll-Like Receptors Cascades, 9606: Toll Like Receptor 4 (TLR4) Cascade, 9606: Activated TLR4 signalling, 9606: MyD88 dependent cascade initiated on endosome, 9606: Toll Like Receptor 7/8 (TLR7/8) Cascade, 9606: Toll Like Receptor 9 (TLR9) Cascade, 9606: MyD88:Mal cascade initiated on plasma membrane, 9606: Toll Like Receptor 2 (TLR2) Cascade, 9606: Toll Like Receptor TLR1:TLR2 Cascade, 9606: Toll Like Receptor TLR6:TLR2 Cascade, 9606: TRAF6 mediated induction of NFkB and MAP kinases upon TLR7/8 or 9 activation, 9606: MyD88-independent cascade, 9606: TRIF-mediated TLR3/TLR4 signaling, 9606: Toll Like Receptor 3 (TLR3) Cascade, B Cell Receptor Signaling Pathway%WikiPathways_20160311%WP23%Homo sapiens, ATM Signaling Pathway%WikiPathways_20160311%WP2516%Homo sapiens, TCR Signaling Pathway%WikiPathways_20160311%WP69%Homo sapiens	2.704849348
41	9606: Cell surface interactions at the vascular wall, 9606: Platelet degranulation, 9606: Response to elevated platelet cytosolic Ca2+, 9606: Platelet Aggregation (Plug Formation), Senescence and Autophagy in Cancer%WikiPathways_20160311%WP615%Homo sapiens, Inflammatory Response Pathway%WikiPathways_20160311%WP453%Homo sapiens	2.668768746
42	9606: p75 NTR receptor-mediated signalling, 9606: G alpha (12/13) signalling events, 9606: Rho GTPase cycle, 9606: Signaling by Rho GTPases, 9606: Cell death signalling via NRAGE, NRIF and NADE, 9606: NRAGE signals death through JNK	2.666085689
43	9606: Mitotic M-M/G1 phases, 9606: M Phase, 9606: Regulatory RNA pathways, 9606: Transcriptional regulation by small RNAs, 9606: Cell Cycle, Mitotic, GO:0006403 RNA localization	2.641649934
44	GWAS:Rheumatism, GWAS:Arthritis, GWAS:Rheumatoid Arthritis	2.527376911
45	9606: Muscle contraction, 9606: Striated Muscle Contraction, Arrhythmogenic Right Ventricular Cardiomyopathy%WikiPathways_20160311%WP2118%Homo sapiens, Striated Muscle Contraction%WikiPathways_20160311%WP383%Homo sapiens	2.452204982
46	9606: Defective B3GAT3 causes JDSSDHD, 9606: Defective B4GALT1 causes B4GALT1-CDG (CDG-2d), 9606: Defective B4GALT7 causes EDS, progeroid type, 9606: Defective CHST14 causes EDS, musculocontractural type, 9606: Defective CHST3 causes SEDCJD, 9606: Defective CHST6 causes MCDC1, 9606: Defective CHSY1 causes TPBS, 9606: Defective EXT1 causes exostoses 1, TRPS2 and CHDS, 9606: Defective EXT2 causes exostoses 2, 9606: Defective PAPSS2 causes SEMD-PA, 9606: Defective SLC26A2 causes chondrodysplasias, 9606: Diseases associated with glycosaminoglycan metabolism, 9606: Diseases of glycosylation, 9606: Glycosaminoglycan metabolism, 9606: MPS I - Hurler syndrome, 9606: MPS II - Hunter syndrome, 9606: MPS IIIA - Sanfilippo syndrome A, 9606: MPS IIIB - Sanfilippo syndrome B, 9606: MPS IIIC - Sanfilippo syndrome C, 9606: MPS IIID - Sanfilippo syndrome D, 9606: MPS IV - Morquio syndrome A, 9606: MPS IV - Morquio syndrome B, 9606: MPS IX - Natowicz syndrome, 9606: MPS VI - Maroteaux-Lamy syndrome, 9606: MPS VII - Sly syndrome, 9606: Mucopolysaccharidoses	2.421670926
47	GWAS:Malabsorption Syndrome, GWAS:Celiac Disease, GWAS:Sprue	2.36925363

Table S1. MultiEnrichment result for microarray input.

	Pathways	**ClusterScore**
1	9606: Fc epsilon receptor (FCERI) signaling, 9606: Innate Immune System, 9606: Signaling by NGF, 9606: Immune System, 9606: Signaling Pathways, 9606: Adaptive Immune System, 9606: Downstream signaling events of B Cell Receptor (BCR), 9606: B Cell Activation, BDNF signaling pathway%WikiPathways_20160311%WP2380%Homo sapiens, Insulin	20.06098638

	Signaling%WikiPathways_20160311%WP481%Homo sapiens, AGE/RAGE pathway%WikiPathways_20160311%WP2324%Homo sapiens, Leptin signaling pathway%WikiPathways_20160311%WP2034%Homo sapiens, IL-4 Signaling Pathway%WikiPathways_20160311%WP395%Homo sapiens, Oncostatin M Signaling Pathway%WikiPathways_20160311%WP2374%Homo sapiens, 9606: Interleukin signaling pathway, hsa04722 Neurotrophin signaling pathway, hsa04910 Insulin signaling pathway	
2	BIOCARTA_GH_PATHWAY, BIOCARTA_INSULIN_PATHWAY, Insulin Pathway, IGF1 pathway, IL2-mediated signaling events, 9606: IRS-mediated signalling, 9606: IRS-related events, 9606: Insulin receptor signalling cascade, 9606: Signaling by Insulin receptor	17.26292077
3	BIOCARTA_IGF1_PATHWAY, 9606: IRS-related events triggered by IGF1R, 9606: IGF1R signaling cascade, 9606: Signaling by Type 1 Insulin-like Growth Factor 1 Receptor (IGF1R), 9606: SHC-related events triggered by IGF1R, 9606: Insulin/IGF pathway-mitogen activated protein kinase kinase/MAP kinase cascade, hsa04914 Progesterone-mediated oocyte maturation	16.36445437
4	9606: Developmental Biology, 9606: Axon guidance, IL-5 Signaling Pathway%WikiPathways_20160311%WP127%Homo sapiens, IL-6 signaling pathway%WikiPathways_20160311%WP364%Homo sapiens, 9606: Ras Pathway, 9606: Angiogenesis	15.0429936
5	Arf1 pathway, ErbB receptor signaling network, Canonical Wnt signaling pathway	14.20214167
6	BIOCARTA_EGF_PATHWAY, BIOCARTA_HER2_PATHWAY, BIOCARTA_ERK_PATHWAY, Internalization of ErbB1, Signaling events mediated by TCPTP	13.68005964
7	BIOCARTA_IGF1R_PATHWAY, BIOCARTA_IL2RB_PATHWAY, BIOCARTA_EIF4_PATHWAY, 9606: Platelet activation, signaling and aggregation, 9606: Hemostasis, TSH signaling pathway%WikiPathways_20160311%WP2032%Homo sapiens, EPO Receptor Signaling%WikiPathways_20160311%WP581%Homo sapiens, Kit receptor signaling pathway%WikiPathways_20160311%WP304%Homo sapiens, IL-2 Signaling Pathway%WikiPathways_20160311%WP49%Homo sapiens, 9606: FGF signaling pathway, hsa04666 Fc gamma R-mediated phagocytosis	13.24159913
8	9606: Downstream signal transduction, 9606: Signaling by PDGF, 9606: Signaling by SCF-KIT, 9606: DAP12 interactions, 9606: DAP12 signaling, 9606: Downstream signaling of activated FGFR, 9606: NGF signalling via TRKA from the plasma membrane, 9606: Signaling by EGFR, 9606: Signaling by EGFR in Cancer, 9606: Signaling by ERBB2, 9606: Signaling by ERBB4, 9606: Signaling by FGFR, 9606: Signaling by FGFR in disease, 9606: Role of LAT2/NTAL/LAB on calcium mobilization, 9606: Disease, DNA Damage Response (only ATM dependent)%WikiPathways_20160311%WP710%Homo sapiens, hsa04012 ErbB signaling pathway	12.48481901
9	9606: Signaling by GPCR, Signaling Pathways in Glioblastoma%WikiPathways_20160311%WP2261%Homo sapiens, Integrated Pancreatic Cancer Pathway%WikiPathways_20160311%WP2377%Homo sapiens, Rac1/Pak1/p38/MMP-2 pathway%WikiPathways_20160311%WP3303%Homo sapiens, Regulation of Actin Cytoskeleton%WikiPathways_20160311%WP51%Homo sapiens, MAPK Signaling Pathway%WikiPathways_20160311%WP382%Homo sapiens, EGF/EGFR Signaling Pathway%WikiPathways_20160311%WP437%Homo sapiens, 9606: EGF receptor signaling pathway, hsa04010 MAPK signaling pathway, GO:0000278 mitotic cell cycle	11.96129591
10	BIOCARTA_RACCYCD_PATHWAY, TWEAK Signaling Pathway%WikiPathways_20160311%WP2036%Homo sapiens, Corticotropin-releasing hormone%WikiPathways_20160311%WP2355%Homo sapiens, Interleukin-11 Signaling Pathway%WikiPathways_20160311%WP2332%Homo sapiens, Regulation of toll-like receptor signaling pathway%WikiPathways_20160311%WP1449%Homo sapiens, Toll-like Receptor Signaling Pathway%WikiPathways_20160311%WP75%Homo sapiens, TCR Signaling Pathway%WikiPathways_20160311%WP69%Homo sapiens, B Cell Receptor Signaling Pathway%WikiPathways_20160311%WP23%Homo sapiens, 9606: T cell	11.17240248

	activation, 9606: Inflammation mediated by chemokine and cytokine signaling pathway, hsa04062 Chemokine signaling pathway, hsa04660 T cell receptor signaling pathway, hsa04662 B cell receptor signaling pathway, hsa04380 Osteoclast differentiation, hsa04620 Toll-like receptor signaling pathway, GO:0002376 immune system process	
11	BIOCARTA_NFAT_PATHWAY, BIOCARTA_IGF1MTOR_PATHWAY, MicroRNAs in cardiomyocyte hypertrophy%WikiPathways_20160311%WP1544%Homo sapiens, Cardiac Hypertrophic Response%WikiPathways_20160311%WP2795%Homo sapiens, Focal Adhesion%WikiPathways_20160311%WP306%Homo sapiens, hsa04510 Focal adhesion, GO:0006468 protein amino acid phosphorylation, GO:0006464 protein modification process, GO:0005975 carbohydrate metabolic process	9.238737981
12	BIOCARTA_KERATINOCYTE_PATHWAY, BIOCARTA_TCR_PATHWAY, BIOCARTA_MAPK_PATHWAY, 9606: Signaling by Interleukins, 9606: Cytokine Signaling in Immune system, 9606: B cell activation, 9606: PDGF signaling pathway, GO:0006350 transcription	6.507310819

Table S2. MultiEnrichment result for Klinger *et al.*[34] input.

	Pathways	**ClusterScore**
1	BIOCARTA_MAPK_PATHWAY, 9606: Activated TLR4 signalling, 9606: MyD88 cascade initiated on plasma membrane, 9606: MyD88 dependent cascade initiated on endosome, 9606: MyD88:Mal cascade initiated on plasma membrane, 9606: TRAF6 mediated induction of NFkB and MAP kinases upon TLR7/8 or 9 activation, 9606: Toll Like Receptor 10 (TLR10) Cascade, 9606: Toll Like Receptor 2 (TLR2) Cascade, 9606: Toll Like Receptor 4 (TLR4) Cascade, 9606: Toll Like Receptor 5 (TLR5) Cascade, 9606: Toll Like Receptor 7/8 (TLR7/8) Cascade, 9606: Toll Like Receptor 9 (TLR9) Cascade, 9606: Toll Like Receptor TLR1:TLR2 Cascade, 9606: Toll Like Receptor TLR6:TLR2 Cascade, 9606: Toll-Like Receptors Cascades, 9606: MyD88-independent cascade, 9606: TRAF6 Mediated Induction of proinflammatory cytokines, 9606: TRIF-mediated TLR3/TLR4 signaling, 9606: Toll Like Receptor 3 (TLR3) Cascade, 9606: MAP kinase activation in TLR cascade	16.24474194
2	BIOCARTA_IL1R_PATHWAY, BIOCARTA_TOLL_PATHWAY, BIOCARTA_KERATINOCYTE_PATHWAY, BIOCARTA_STRESS_PATHWAY, IL-1 signaling pathway%WikiPathways_20160311%WP195%Homo sapiens, TNF alpha Signaling Pathway%WikiPathways_20160311%WP231%Homo sapiens, Structural Pathway of Interleukin 1 (IL-1)%WikiPathways_20160311%WP2637%Homo sapiens, Apoptosis%WikiPathways_20160311%WP254%Homo sapiens, 9606: Apoptosis signaling pathway, 9606: T cell activation, hsa04622 RIG-I-like receptor signaling pathway, hsa04621 NOD-like receptor signaling pathway	14.63108475
3	Regulation of toll-like receptor signaling pathway%WikiPathways_20160311%WP1449%Homo sapiens, Toll-like Receptor Signaling Pathway%WikiPathways_20160311%WP75%Homo sapiens, RANKL/RANK Signaling Pathway%WikiPathways_20160311%WP2018%Homo sapiens, TWEAK Signaling Pathway%WikiPathways_20160311%WP2036%Homo sapiens, TCR Signaling Pathway%WikiPathways_20160311%WP69%Homo sapiens, Corticotropin-releasing hormone%WikiPathways_20160311%WP2355%Homo sapiens, TSLP Signaling Pathway%WikiPathways_20160311%WP2203%Homo sapiens, Integrated Pancreatic Cancer Pathway%WikiPathways_20160311%WP2377%Homo sapiens, B Cell Receptor Signaling Pathway%WikiPathways_20160311%WP23%Homo sapiens, Oncostatin M Signaling	11.74790017

	Pathway%WikiPathways_20160311%WP2374%Homo sapiens, AGE/RAGE pathway%WikiPathways_20160311%WP2324%Homo sapiens, 9606: B cell activation, 9606: Toll receptor signaling pathway, hsa04380 Osteoclast differentiation, hsa04620 Toll-like receptor signaling pathway	
4	9606: Immune System, 9606: Innate Immune System, 9606: Signaling Pathways, 9606: Signaling by NGF, 9606: Fc epsilon receptor (FCERI) signaling, 9606: NGF signalling via TRKA from the plasma membrane, BDNF signaling pathway%WikiPathways_20160311%WP2380%Homo sapiens, Insulin Signaling%WikiPathways_20160311%WP481%Homo sapiens, 9606: Interleukin signaling pathway, hsa04722 Neurotrophin signaling pathway, GO:0006468 protein amino acid phosphorylation, GO:0006464 protein modification process	11.42178042
5	Canonical Wnt signaling pathway, p75(NTR)-mediated signaling, IL2-mediated signaling events, IL1-mediated signaling events, Insulin Pathway, IGF1 pathway, Arf1 pathway	10.84298622
6	9606: Cellular responses to stress, 9606: Cellular Senescence, MAPK Signaling Pathway%WikiPathways_20160311%WP382%Homo sapiens, Senescence and Autophagy in Cancer%WikiPathways_20160311%WP615%Homo sapiens, EGF/EGFR Signaling Pathway%WikiPathways_20160311%WP437%Homo sapiens, hsa04010 MAPK signaling pathway	9.575396636
7	BIOCARTA_NFKB_PATHWAY, 9606: Downstream signaling events of B Cell Receptor (BCR), 9606: Adaptive Immune System, 9606: B Cell Activation, Rac1/Pak1/p38/MMP-2 pathway%WikiPathways_20160311%WP3303%Homo sapiens, IL-4 Signaling Pathway%WikiPathways_20160311%WP395%Homo sapiens, hsa04660 T cell receptor signaling pathway, hsa04210 Apoptosis, hsa04662 B cell receptor signaling pathway, hsa04920 Adipocytokine signaling pathway, hsa04062 Chemokine signaling pathway, GO:0002376 immune system process	8.788714024
8	BIOCARTA_P38MAPK_PATHWAY, Interferon type I signaling pathways%WikiPathways_20160311%WP585%Homo sapiens, p38 MAPK Signaling Pathway%WikiPathways_20160311%WP400%Homo sapiens, 9606: p38 MAPK pathway	7.750694572
9	GO:0006357 regulation of transcription from RNA polymerase II promoter, GO:0006366 transcription from RNA polymerase II promoter, GO:0006350 transcription, GO:0006351 transcription, DNA-dependent, GO:0006355 regulation of transcription, DNA-dependent, GO:0006139 nucleobase, nucleoside, nucleotide and nucleic acid metabolic process	6.12243951
10	BIOCARTA_NFAT_PATHWAY, 9606: Hemostasis, TSH signaling pathway%WikiPathways_20160311%WP2032%Homo sapiens, Cardiac Hypertrophic Response%WikiPathways_20160311%WP2795%Homo sapiens, Estrogen signaling pathway%WikiPathways_20160311%WP712%Homo sapiens, MicroRNAs in cardiomyocyte hypertrophy%WikiPathways_20160311%WP1544%Homo sapiens, TGF-beta Signaling Pathway%WikiPathways_20160311%WP366%Homo sapiens, Kit receptor signaling pathway%WikiPathways_20160311%WP304%Homo sapiens, 9606: Ras Pathway, 9606: Angiogenesis, 9606: EGF receptor signaling pathway, 9606: Inflammation mediated by chemokine and cytokine signaling pathway, hsa04664 Fc epsilon RI signaling pathway, hsa04914 Progesterone-mediated oocyte maturation, GO:0005975 carbohydrate metabolic process	5.595213575
11	9606: Downstream signal transduction, 9606: Signaling by PDGF, 9606: Signaling by SCF-KIT, 9606: Developmental Biology, 9606: Signaling by FGFR in disease, 9606: Axon guidance, 9606: DAP12 interactions, 9606: DAP12 signaling, 9606: Downstream signaling of activated FGFR, 9606: Signaling by EGFR, 9606: Signaling by EGFR in Cancer, 9606: Signaling by ERBB2, 9606: Signaling by ERBB4, 9606: Disease, 9606:	5.344744932

	Signaling by FGFR, 9606: Signaling by GPCR	
1 2	IL6-mediated signaling events, 9606: Cytokine Signaling in Immune system, 9606: Signaling by Interleukins, 9606: IGF1R signaling cascade, 9606: Signaling by Type 1 Insulin-like Growth Factor 1 Receptor (IGF1R)	5.096836186

Table S3. MultiEnrichment result for Morris *et al*. [35] input.