

ID	Description	GeneRatio	BgRatio	pvalue	p.adjust	qvalue
GO:0030198	extracellular matrix organization	51/90	348/184	5.76E-93	9.84E-62	7.30E-62
GO:0043062	extracellular structure organization	51/90	402/184	1.38E-93	1.18E-58	8.77E-59
GO:0030199	collagen fibril organization	19/90	52/1849	1.01E-3	5.74E-31	4.26E-29
GO:0061448	connective tissue development	20/90	263/184	1.16E-93	4.96E-18	3.68E-16
GO:0051216	cartilage development	17/90	206/184	1.47E-93	5.02E-16	3.73E-14
GO:0048705	skeletal system morphogenesis	17/90	236/184	1.45E-93	4.12E-15	3.06E-13
GO:0031589	cell-substrate adhesion	19/90	338/184	2.53E-93	6.17E-15	4.58E-13
GO:0035987	endodermal cell differentiation	10/90	45/1849	1.24E-3	2.64E-14	1.96E-12
GO:0002062	chondrocyte differentiation	13/90	117/184	1.44E-93	2.72E-14	2.02E-12
GO:0001706	endoderm formation	10/90	50/1849	3.90E-3	6.66E-14	4.94E-12
GO:0001503	ossification	18/90	380/184	2.81E-93	4.36E-13	3.24E-11
GO:0002063	chondrocyte development	9/90	45/1849	7.80E-3	1.11E-13	8.23E-11
GO:0060348	bone development	14/90	208/184	1.42E-93	1.87E-12	1.39E-10
GO:0007492	endoderm development	10/90	74/1849	2.48E-3	3.03E-12	2.25E-10
GO:0007178	transmembrane receptor protein serine/threonine kinase signaling pathway	16/90	340/184	7.51E-93	8.55E-12	6.34E-10
GO:0001704	formation of primary germ layer	11/90	118/184	1.21E-93	1.29E-11	9.57E-09
GO:0071559	response to transforming growth factor beta	14/90	249/184	1.63E-93	1.63E-11	1.21E-09
GO:0071560	cellular response to transforming growth factor beta stimulus	13/90	242/184	1.61E-93	1.53E-10	1.13E-08
GO:0010810	regulation of cell-substrate adhesion	12/90	209/184	4.00E-93	3.60E-10	2.67E-08
GO:0007160	cell-matrix adhesion	12/90	222/184	8.00E-93	6.83E-10	5.06E-08

**Supplementary table4** The top 20 enrichment terms of the exemplar genes in stromal cluster by NMF.