Single CpG KEGG Pathway enrichment
by Cell Type

Human papillomavirus infection
Pathways in cancer
Breast cancer
Focal adhesion
Rap1 signaling pathway
Axon guidance
Proteoglycans in cancer
EGFR tyrosine kinase inhibitor resistance
Wnt signaling pathway
Small cell lung cancer
Sphingolipid signaling pathway
Relaxin signaling pathway
MAPK signaling pathway
Bacterial invasion of epithelial cells
mTOR signaling pathway
Thyroid hormone signaling pathway
Apoptosis
Gap junction
PI3K−Akt signaling pathway
Hepatocellular carcinoma
Adherens junction
Choline metabolism in cancer
HTLV−I infection
Prolactin signaling pathway
Signaling pathways regulating pluripotency of stem cells
Ubiquitin mediated proteolysis
Basal cell carcinoma
Melanogenesis
Purine metabolism
Platelet activation
Hepatitis B
Hippo signaling pathway
Pancreatic cancer
AGE−RAGE signaling pathway in diabetic complications
ErbB signaling pathway
Neurotrophin signaling pathway
Tight junction
Lysine degradation
Endocrine resistance
Colorectal cancer
Insulin resistance
Insulin signaling pathway
Endometrial cancer
Peroxisome
Phospholipase D signaling pathway
Regulation of actin cytoskeleton
Cell cycle
Ras signaling pathway
Chronic myeloid leukemia
Acute myeloid leukemia
Non−small cell lung cancer
HIF−1 signaling pathway
Glutamatergic synapse
Fat digestion and absorption
Hepatitis C

All
(6264)
GenesPlusPromoters
(6221)
Genes
(6133)
Promoters
(2544)

p.adjust
0.04
0.03
0.02
0.01

GeneRatio
0.02
0.04
0.06

Single CpG Biological Process GO enrichment
by Cell Type

heart development
cell−cell signaling by wnt
Wnt signaling pathway
regulation of cell morphogenesis
regulation of neuron projection development
positive regulation of cell projection organization
lipid catabolic process
response to extracellular stimulus
striated muscle cell differentiation
regulation of developmental growth
actomyosin structure organization
chromosome segregation
muscle tissue development
positive regulation of mitotic cell cycle
monosaccharide transport
axonogenesis
striated muscle tissue development
response to nutrient levels
blood vessel morphogenesis
regulation of membrane potential
hexose transport
canonical Wnt signaling pathway
response to oxygen levels
phospholipid metabolic process
positive regulation of protein kinase activity
glucose transport
response to hypoxia
muscle cell development
regulation of sequence−specific DNA binding transcription factor activity
regulation of mitotic cell cycle phase transition
regulation of cell cycle phase transition
positive regulation of cellular catabolic process
regulation of cellular component size
glycoprotein metabolic process
cardiac muscle tissue development
in utero embryonic development
regulation of Wnt signaling pathway
mitotic nuclear division
positive regulation of cell development
microtubule cytoskeleton organization
monocarboxylic acid catabolic process
activation of protein kinase activity
glycerolipid metabolic process
response to decreased oxygen levels
glycoprotein biosynthetic process
regulation of anatomical structure size
regulation of actin filament−based process
eye development
glucose import
glycerophospholipid metabolic process
camera−type eye development
reproductive system development
positive regulation of catabolic process
regulation of actin cytoskeleton organization
reproductive structure development
angiogenesis
axon development
negative regulation of cell development
tube morphogenesis
forebrain development
regulation of system process
regulation of cytoskeleton organization
modulation of synaptic transmission
cornification
epidermis development
skin development
epidermal cell differentiation
keratinization
keratinocyte differentiation
carboxylic acid transmembrane transport
organic acid transmembrane transport
vitamin D metabolic process

All
(14709)
GenesPlusPromoters
(14617)
Genes
(14430)
Promoters
(6121)

GeneRatio
0.01
0.02
0.03

p.adjust
0.04
0.03
0.02
0.01

Single CpG Molecular Function GO enrichment
by Cell Type

RNA polymerase II transcription factor binding
actin binding
phosphatase binding
protein serine/threonine kinase activity
phospholipid binding
gated channel activity
metal ion transmembrane transporter activity
core promoter proximal region sequence−specific DNA binding
RNA polymerase II core promoter proximal region sequence−specific DNA binding
cofactor binding
core promoter proximal region DNA binding
chromatin binding
ubiquitin−like protein transferase activity
transcription factor activity, RNA polymerase II core promoter proximal region sequence−specific binding
protein phosphatase binding
ubiquitin−protein transferase activity
inorganic anion transmembrane transporter activity
protein tyrosine kinase activity
phosphatidylinositol binding
phosphoprotein binding
ion channel activity
active transmembrane transporter activity
magnesium ion binding
tubulin binding
microtubule binding
anion transmembrane transporter activity
phosphatidylinositol phosphate binding
phosphoric ester hydrolase activity
calmodulin binding
passive transmembrane transporter activity
channel activity
lipid transporter activity
substrate−specific channel activity
cation channel activity
transmembrane receptor protein kinase activity
sodium ion transmembrane transporter activity
beta−catenin binding
signal transducer, downstream of receptor, with serine/threonine kinase activity
coenzyme binding
secondary active transmembrane transporter activity
potassium ion transmembrane transporter activity
glycoprotein binding
transcription coactivator activity
protein C−terminus binding
ubiquitin−like protein ligase binding
extracellular ligand−gated ion channel activity
cell adhesion molecule binding
protein phosphorylated amino acid binding
transcriptional activator activity, RNA polymerase II core promoter proximal region sequence−specific binding
ubiquitin−like protein ligase activity
Ras guanyl−nucleotide exchange factor activity
transcriptional activator activity, RNA polymerase II transcription regulatory region sequence−specific binding
cadherin binding

All
(14709)
GenesPlusPromoters
(14617)
Genes
(14433)
Promoters
(6078)

p.adjust
0.04
0.03
0.02
0.01

GeneRatio
0.01
0.02
0.03

Single CpG Cellular Compartment GO enrichment
by Cell Type

nuclear envelope
actin cytoskeleton
membrane region
receptor complex
membrane microdomain
membrane raft
microtubule
nuclear membrane
apical part of cell
cell leading edge
dendrite
centrosome
synaptic membrane
postsynapse
cell cortex
cytoplasmic side of plasma membrane
peroxisome
microbody
apical plasma membrane
outer membrane
cell−cell junction
mitochondrial outer membrane
organelle outer membrane
extrinsic component of membrane
integral component of organelle membrane
cytoplasmic side of membrane
presynapse
cytoplasmic region
chromosome, centromeric region
axon
extrinsic component of plasma membrane
neuromuscular junction
intrinsic component of organelle membrane
transmembrane transporter complex
cell−cell adherens junction
brush border
transporter complex
actin filament
mitochondrial matrix
apical junction complex
ion channel complex
adherens junction
extrinsic component of cytoplasmic side of plasma membrane
occluding junction
postsynaptic membrane
plasma membrane receptor complex
cell body
ruffle
neuronal cell body
postsynaptic specialization
intermediate filament cytoskeleton
intermediate filament
proteinaceous extracellular matrix

All
(15612)
GenesPlusPromoters
(15507)
Genes
(15311)
Promoters
(6472)

GeneRatio
0.01
0.02

p.adjust
0.03
0.02
0.01

Single CpG Disease Ontology enrichment
by Cell Type

pancreatic cancer
breast carcinoma
pancreatic carcinoma
autosomal dominant disease
central nervous system cancer
musculoskeletal system cancer
pancreas adenocarcinoma
head and neck cancer
pulmonary hypertension
Alzheimer's disease
head and neck carcinoma
brain infarction
pancreatic ductal adenocarcinoma
ischemic bone disease
amyotrophic lateral sclerosis
connective tissue cancer
tauopathy
biliary tract cancer
thyroid cancer
kidney cancer
cerebral infarction
renal carcinoma
thyroid carcinoma
retinal cancer
female reproductive organ cancer
urinary system cancer
physical disorder
muscle cancer
retinoblastoma
retinal cell cancer
thyroid medullary carcinoma
head and neck squamous cell carcinoma
skeletal muscle cancer

All
(6805)
GenesPlusPromoters
(6772)
Genes
(6703)

GeneRatio
0.02
0.04
0.06

p.adjust
0.04
0.03
0.02
0.01

Single CpG KEGG Pathway enrichment
by Cell Type

Human papillomavirus infection
Pathways in cancer
Focal adhesion
Sphingolipid signaling pathway
EGFR tyrosine kinase inhibitor resistance
Axon guidance
Rap1 signaling pathway
Breast cancer
Adherens junction
Relaxin signaling pathway
PI3K−Akt signaling pathway
Proteoglycans in cancer
Wnt signaling pathway
Platelet activation
Gap junction
Bacterial invasion of epithelial cells
MAPK signaling pathway
ErbB signaling pathway
Thyroid hormone signaling pathway
Peroxisome
Lysine degradation
mTOR signaling pathway
Small cell lung cancer
Hepatocellular carcinoma
Prolactin signaling pathway
HIF−1 signaling pathway
Phospholipase D signaling pathway
AGE−RAGE signaling pathway in diabetic complications
Choline metabolism in cancer
Insulin resistance
Ras signaling pathway
Endocrine resistance
HTLV−I infection
Apoptosis
ECM−receptor interaction
Melanogenesis
Ubiquitin mediated proteolysis
Regulation of actin cytoskeleton
Neurotrophin signaling pathway
Jak−STAT signaling pathway
Tight junction
Hepatitis B
Longevity regulating pathway
Hedgehog signaling pathway
Purine metabolism
Glycerophospholipid metabolism
Glutamatergic synapse
Signaling pathways regulating pluripotency of stem cells
Acute myeloid leukemia
Insulin signaling pathway
Pancreatic cancer
Central carbon metabolism in cancer
Morphine addiction
Arrhythmogenic right ventricular cardiomyopathy (ARVC)
Fat digestion and absorption
Endocytosis
Hippo signaling pathway
Chronic myeloid leukemia
VEGF signaling pathway
Melanoma
Endometrial cancer
Non−small cell lung cancer
Prostate cancer
Inositol phosphate metabolism
Linoleic acid metabolism
Oxytocin signaling pathway
Phosphatidylinositol signaling system
Renal cell carcinoma
Colorectal cancer
Valine, leucine and isoleucine degradation
Protein processing in endoplasmic reticulum
Cholinergic synapse
Glioma
Long−term potentiation
GnRH signaling pathway
Estrogen signaling pathway
Glycosphingolipid biosynthesis − globo and isoglobo series

All.pos (6143)
GenesPlusPromoters.pos (6062)
Genes.pos (5946)
Promoters.pos (2147)
All.neg (5597)
GenesPlusPromoters.neg (5382)
Genes.neg (5270)
Promoters.neg (1419)

GeneRatio
0.02
0.04
0.06

p.adjust
0.04
0.03
0.02
0.01

Single CpG Biological Process GO enrichment
by Cell Type

positive regulation of cell projection organization
glycoprotein metabolic process
regulation of cell morphogenesis
lipid catabolic process
actomyosin structure organization
phospholipid metabolic process
heart development
striated muscle cell differentiation
glycoprotein biosynthetic process
regulation of neuron projection development
monosaccharide transport
hexose transport
response to extracellular stimulus
glycerolipid metabolic process
glucose transport
chromosome segregation
response to oxygen levels
glycerophospholipid metabolic process
positive regulation of neuron projection development
regulation of developmental growth
response to hypoxia
cellular response to abiotic stimulus
cell−cell signaling by wnt
regulation of cell cycle phase transition
mitotic nuclear division
cellular lipid catabolic process
Wnt signaling pathway
cellular response to radiation
cellular response to peptide hormone stimulus
regulation of mitotic cell cycle phase transition
regulation of membrane potential
carbohydrate transport
axonogenesis
response to decreased oxygen levels
positive regulation of cellular catabolic process
response to nutrient levels
positive regulation of mitotic cell cycle
monocarboxylic acid catabolic process
cellular response to peptide
response to oxidative stress
ammonium ion metabolic process
microtubule cytoskeleton organization
eye development
organelle disassembly
transition metal ion homeostasis
inorganic anion transport
positive regulation of catabolic process
plasma membrane organization
positive regulation of proteolysis
positive regulation of protein kinase activity
stress−activated protein kinase signaling cascade
dephosphorylation
organic hydroxy compound metabolic process
cilium assembly
cilium organization
activation of protein kinase activity
mitophagy
mitochondrion disassembly
stress−activated MAPK cascade
blood vessel morphogenesis
small GTPase mediated signal transduction
negative regulation of mitotic cell cycle
establishment or maintenance of cell polarity
protein autophosphorylation
axon development
nuclear chromosome segregation
lipid modification
protein secretion
regulation of actin filament−based process
small molecule catabolic process
organic acid catabolic process
carboxylic acid catabolic process
regulation of cellular component size
developmental cell growth
positive regulation of cell development
positive regulation of neuron differentiation
regulation of cytoskeleton organization
response to radiation
Ras protein signal transduction
multicellular organism growth
regulation of anatomical structure size
regulation of cell morphogenesis involved in differentiation
muscle tissue development
regulation of small GTPase mediated signal transduction
regulation of autophagy
protein polyubiquitination
striated muscle tissue development
regulation of Wnt signaling pathway
proteasomal protein catabolic process
neuron projection guidance
canonical Wnt signaling pathway
axon guidance
proteasome−mediated ubiquitin−dependent protein catabolic process
histone modification
positive regulation of neurogenesis
organelle localization
autophagy
in utero embryonic development
carboxylic acid transport
organic acid transport
single−organism behavior
establishment of organelle localization
cornification
epidermis development
epidermal cell differentiation
keratinization
skin development
keratinocyte differentiation
carboxylic acid transmembrane transport
vitamin D metabolic process
organic acid transmembrane transport
cytokine secretion
exocrine system development
amino acid transmembrane transport
forebrain development
peptidyl−lysine modification
macromolecule methylation
positive regulation of nervous system development
pattern specification process
modulation of synaptic transmission
central nervous system neuron differentiation
regulation of neurotransmitter levels
regulation of synaptic plasticity
regionalization
neurotransmitter transport
presynaptic process involved in chemical synaptic transmission
neurotransmitter secretion
signal release from synapse
long−term synaptic potentiation

All.pos (14422)
GenesPlusPromoters.pos (14227)
Genes.pos (13962)
Promoters.pos (5117)
All.neg (13325)
GenesPlusPromoters.neg (12883)
Genes.neg (12582)
Promoters.neg (3538)

p.adjust
0.04
0.03
0.02
0.01

GeneRatio
0.01
0.02
0.03
0.04

Single CpG Molecular Function GO enrichment
by Cell Type

phospholipid binding
phosphatase binding
RNA polymerase II transcription factor binding
protein serine/threonine kinase activity
actin binding
metal ion transmembrane transporter activity
gated channel activity
cofactor binding
phosphatidylinositol binding
protein tyrosine kinase activity
inorganic anion transmembrane transporter activity
phosphoric ester hydrolase activity
ion channel activity
protein phosphatase binding
anion transmembrane transporter activity
microtubule binding
cation channel activity
magnesium ion binding
phosphatidylinositol phosphate binding
signal transducer, downstream of receptor, with serine/threonine kinase activity
Ras guanyl−nucleotide exchange factor activity
substrate−specific channel activity
beta−catenin binding
ubiquitin−like protein transferase activity
cell adhesion molecule binding
passive transmembrane transporter activity
active transmembrane transporter activity
channel activity
phosphoprotein binding
calmodulin binding
extracellular ligand−gated ion channel activity
secondary active transmembrane transporter activity
ubiquitin−protein transferase activity
protein phosphorylated amino acid binding
tubulin binding
coenzyme binding
sodium ion transmembrane transporter activity
phosphatase activity
ligand−gated ion channel activity
ligand−gated channel activity
glycoprotein binding
transmembrane receptor protein kinase activity
SH3 domain binding
histone deacetylase activity
protein deacetylase activity
guanyl−nucleotide exchange factor activity
microtubule motor activity
protein binding involved in cell adhesion
actin filament binding
phosphatidylinositol 3−kinase activity
GTPase binding
chloride transmembrane transporter activity
cadherin binding
signal transducer activity, downstream of receptor
small GTPase binding
DNA−dependent ATPase activity
Ras GTPase binding
sulfur compound binding
carboxylic acid transmembrane transporter activity
organic acid transmembrane transporter activity
heparin binding
glycosaminoglycan binding
core promoter proximal region sequence−specific DNA binding
core promoter proximal region DNA binding
hormone activity
transcription factor activity, RNA polymerase II core promoter proximal region sequence−specific binding
chromatin binding
transcription coactivator activity
RNA polymerase II core promoter proximal region sequence−specific DNA binding
transcriptional repressor activity, RNA polymerase II transcription regulatory region sequence−specific binding
ATPase activity
transcriptional activator activity, RNA polymerase II core promoter proximal region sequence−specific binding
S−adenosylmethionine−dependent methyltransferase activity
protein methyltransferase activity
protein C−terminus binding
transcriptional activator activity, RNA polymerase II transcription regulatory region sequence−specific binding
flavin adenine dinucleotide binding
transmembrane receptor protein tyrosine kinase activity
monovalent inorganic cation transmembrane transporter activity
ATPase activity, coupled
nucleoside−triphosphatase regulator activity
glutamate receptor activity

All.pos (14427)
GenesPlusPromoters.pos (14231)
Genes.pos (13969)
Promoters.pos (5090)
All.neg (13357)
GenesPlusPromoters.neg (12925)
Genes.neg (12627)
Promoters.neg (3539)

p.adjust
0.04
0.03
0.02
0.01

GeneRatio
0.01
0.02
0.03

Single CpG Cellular Compartment GO enrichment
by Cell Type

nuclear envelope
actin cytoskeleton
receptor complex
membrane region
apical part of cell
nuclear membrane
microtubule
membrane microdomain
extrinsic component of membrane
membrane raft
centrosome
peroxisome
microbody
dendrite
apical plasma membrane
cytoplasmic side of plasma membrane
cell cortex
postsynapse
cell leading edge
cytoplasmic side of membrane
extrinsic component of plasma membrane
chromosome, centromeric region
cell−cell junction
cell−cell adherens junction
mitochondrial matrix
extrinsic component of cytoplasmic side of plasma membrane
adherens junction
integral component of organelle membrane
plasma membrane receptor complex
synaptic membrane
ruffle
presynapse
transmembrane transporter complex
spindle
transporter complex
cytoplasmic region
neuron spine
ion channel complex
microbody part
peroxisomal part
dendritic spine
actin−based cell projection
apical junction complex
endoplasmic reticulum lumen
early endosome
microvillus
extracellular matrix component
cell projection membrane
collagen trimer
axon
brush border
neuronal cell body
intrinsic component of organelle membrane
cell body
mitochondrial outer membrane
basolateral plasma membrane
histone deacetylase complex
postsynaptic specialization
postsynaptic membrane
postsynaptic density
microtubule associated complex
cation channel complex
integral component of Golgi membrane
cell−substrate junction
transport vesicle
synaptic vesicle
neuron to neuron synapse
asymmetric synapse
endosome membrane
cell−substrate adherens junction
exocytic vesicle
focal adhesion
proteinaceous extracellular matrix
intermediate filament cytoskeleton
intermediate filament
Golgi lumen
myosin complex
nuclear speck
axon part
lamellipodium
cell−cell contact zone
potassium channel complex
voltage−gated potassium channel complex
site of polarized growth
growth cone
presynaptic membrane
intrinsic component of Golgi membrane
main axon
PcG protein complex
synaptic vesicle membrane
exocytic vesicle membrane
intrinsic component of synaptic vesicle membrane
axon initial segment
integral component of synaptic vesicle membrane

All.pos (15304)
GenesPlusPromoters.pos (15089)
Genes.pos (14813)
Promoters.pos (5428)
All.neg (14103)
GenesPlusPromoters.neg (13635)
Genes.neg (13313)
Promoters.neg (3739)

GeneRatio
0.01
0.02
0.03

p.adjust
0.04
0.03
0.02
0.01

Single CpG Disease Ontology enrichment
by Cell Type

pancreatic cancer
breast carcinoma
pancreatic carcinoma
pancreas adenocarcinoma
autosomal dominant disease
pancreatic ductal adenocarcinoma
head and neck cancer
head and neck carcinoma
amyotrophic lateral sclerosis
hematopoietic system disease
biliary tract cancer
central nervous system cancer
head and neck squamous cell carcinoma
Alzheimer's disease
arteriosclerotic cardiovascular disease
hypertrophic cardiomyopathy
brain infarction
lipid metabolism disorder
familial hyperlipidemia
atherosclerosis
renal carcinoma
renal cell carcinoma
kidney cancer
muscle cancer
urinary system cancer
musculoskeletal system cancer
thyroid carcinoma
thyroid cancer
ovarian cancer
large intestine cancer
motor neuron disease
colorectal cancer
cerebral infarction
ischemic bone disease
hereditary breast ovarian cancer
bone marrow disease
corneal disease

All.pos
(6678)
GenesPlusPromoters.pos
(6605)
Genes.pos
(6496)
Genes.neg
(5949)

p.adjust
0.04
0.03
0.02
0.01

GeneRatio
0.02
0.04
0.06