

MyGene.info R Client

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1 Overview

MyGene.Info provides simple-to-use REST web services to query/retrieve gene annotation data. It's designed with simplicity and performance emphasized. *mygene* is an easy-to-use R wrapper to access MyGene.Info services.

2 Gene Annotation Service

2.1 `getGene`

- Use `getGene`, the wrapper for GET query of `"/gene/<geneid>"` service, to return the gene object for the given geneid.

```
> gene <- getGene("1017", fields="all")
> length(gene)

[1] 1

> gene["name"]

[[1]]
NULL

> gene["taxid"]

[[1]]
NULL

> gene["uniprot"]

[[1]]
NULL

> gene["refseq"]

[[1]]
NULL
```

2.2 `getGenes`

- Use `getGenes`, the wrapper for POST query of `"/gene"` service, to return the list of gene objects for the given character vector of geneids.

```
> getGenes(c("1017", "1018", "ENSG00000148795"))  
  
DataFrame with 3 rows and 7 columns  
      query      _id  X_score  entrezgene  
      <character> <character> <numeric> <character>  
1      1017      1017 20.537415      1017  
2      1018      1018 21.436335      1018  
3  ENSG00000148795      1586 19.193808      1586  
  
      name      symbol      taxid  
      <character> <character> <integer>  
1      cyclin dependent kinase 2      CDK2      9606  
2      cyclin dependent kinase 3      CDK3      9606  
3  cytochrome P450 family 17 subfamily A member 1      CYP17A1      9606
```

3 Gene Query Service

3.1 query

- Use `query`, a wrapper for GET query of `"/query?q=<query>"` service, to return the query result.

```
> query(q="cdk2", size=5)  
  
$max_score  
[1] 430.2405  
  
$took  
[1] 80  
  
$total  
[1] 788  
  
$hits  
      _id  _score  entrezgene      name  symbol  taxid  
1      1017 430.2405      1017  cyclin dependent kinase 2  CDK2  9606  
2      12566 363.7316      12566  cyclin-dependent kinase 2  Cdk2  10090  
3      362817 303.8071      362817  cyclin dependent kinase 2  Cdk2  10116  
4  100117828 286.7188  100117828  cyclin dependent kinase 2  Cdk2  7425  
5  109992509 286.7188  109992509  cyclin dependent kinase 2  cdk2  56723
```

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```
> query(q="NM_013993")

$max_score
[1] 6.604758

$took
[1] 43

$total
[1] 1

$hits
  _id  _score entrezgene          name symbol
1 780 6.604758      780 discoidin domain receptor tyrosine kinase 1  DDR1
  taxid
1 9606
```

3.2 queryMany

- Use `queryMany`, a wrapper for POST query of `"/query"` service, to return the batch query result.

```
> queryMany(c('1053_at', '117_at', '121_at', '1255_g_at', '1294_at'),
+           scopes="reporter", species="human")

Finished
Pass returnall=TRUE to return lists of duplicate or missing query terms.
DataFrame with 6 rows and 7 columns
```

	query	_id	X_score	entrezgene	name	symbol	taxid
	<character>	<character>	<numeric>	<character>	<character>	<character>	<integer>
1	1053_at	5982	11.491839	5982	replication factor C subunit 2	RFC2	9606
2	117_at	3310	10.90951	3310	heat shock protein family A (Hsp70) member 6	HSPA6	9606
3	121_at	7849	12.553523	7849	paired box 8	PAX8	9606
4	1255_g_at	2978	11.7504015	2978			
5	1294_at	100847079	11.329279	100847079			
6	1294_at	7318	10.88698	7318			

4	guanylate cyclase activator 1A	GUCA1A	9606
5	microRNA 5193	MIR5193	9606
6	ubiquitin like modifier activating enzyme 7	UBA7	9606

4 makeTxDbFromMyGene

TxDb is a container for storing transcript annotations. `makeTxDbFromMyGene` allows the user to make a TxDb object in the Genomic Features package from a mygene "exons" query using a default mygene object.

```
> xli <- c('CCDC83',
+         'MAST3',
+         'RPL11',
+         'ZDHHC20',
+         'LUC7L3',
+         'SNORD49A',
+         'CTSH',
+         'ACOT8')
> txdb <- makeTxDbFromMyGene(xli,
+                            scopes="symbol", species="human")
> transcripts(txdb)
```

GRanges object with 17 ranges and 2 metadata columns:

	seqnames	ranges	strand	tx_id	tx_name
	<Rle>	<IRanges>	<Rle>	<integer>	<character>
[1]	11	85855100-85920020	+	1	NM_001286159
[2]	11	85855100-85920020	+	2	NM_173556
[3]	19	18097777-18151686	+	3	NM_015016
[4]	1	23691805-23696835	+	4	NM_000975
[5]	1	23691778-23696426	+	5	NM_001199802
...
[13]	17	50719602-50756215	+	13	NM_016424
[14]	17	16440035-16440106	+	14	NR_002744
[15]	15	78921749-78945098	-	15	NM_001319137
[16]	15	78921749-78945098	-	16	NM_004390
[17]	20	45841720-45857392	-	17	NM_005469

seqinfo: 7 sequences from an unspecified genome; no seqlengths

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makeTxDbFromMyGene invokes either the query or queryMany method and passes the response to construct a TxDb object. See ?TxDb for methods to utilize and access transcript annotations.

5 Tutorial, ID mapping

ID mapping is a very common, often not fun, task for every bioinformatician. Supposedly you have a list of gene symbols or reporter ids from an upstream analysis, and then your next analysis requires to use gene ids (e.g. Entrez gene ids or Ensembl gene ids). So you want to convert that list of gene symbols or reporter ids to corresponding gene ids.

Here we want to show you how to do ID mapping quickly and easily.

5.1 Mapping gene symbols to Entrez gene ids

Suppose xli is a list of gene symbols you want to convert to entrez gene ids:

```
> xli <- c('DDX26B',
+         'CCDC83',
+         'MAST3',
+         'FLOT1',
+         'RPL11',
+         'ZDHHC20',
+         'LUC7L3',
+         'SNORD49A',
+         'CTSH',
+         'ACOT8')
```

You can then call queryMany method, telling it your input is symbol, and you want entrezgene (Entrez gene ids) back.

```
> queryMany(xli, scopes="symbol", fields="entrezgene", species="human")
Finished
Pass returnall=TRUE to return lists of duplicate or missing query terms.
DataFrame with 11 rows and 5 columns
```

	query	notfound	_id	X_score	entrezgene
	<character>	<logical>	<character>	<numeric>	<character>
1	DDX26B	TRUE	NA	NA	NA
2	CCDC83	NA	220047	88.68475	220047

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3	MAST3	NA	23031	86.67129	23031
4	FLOT1	NA	10211	89.66981	10211
5	RPL11	NA	6135	82.61896	6135
6	ZDHHC20	NA	253832	86.49615	253832
7	LUC7L3	NA	51747	86.15927	51747
8	SNORD49A	NA	ENSG00000277370	103.42631	NA
9	SNORD49A	NA	26800	103.42631	26800
10	CTSH	NA	1512	84.19048	1512
11	ACOT8	NA	10005	83.2431	10005

5.2 Mapping gene symbols to Ensembl gene ids

Now if you want Ensembl gene ids back:

```
> out <- queryMany(xli, scopes="symbol", fields="ensembl.gene", species="human")
```

Finished

Pass `returnall=TRUE` to return lists of duplicate or missing query terms.

```
> out
```

DataFrame with 11 rows and 5 columns

	query	notfound	_id	X_score
	<character>	<logical>	<character>	<numeric>
1	DDX26B	TRUE	NA	NA
2	CCDC83	NA	220047	88.69386
3	MAST3	NA	23031	86.48055
4	FLOT1	NA	10211	90.25903
5	RPL11	NA	6135	82.65144
6	ZDHHC20	NA	253832	86.61543
7	LUC7L3	NA	51747	86.15276
8	SNORD49A	NA	ENSG00000277370	103.37979
9	SNORD49A	NA	26800	103.37979
10	CTSH	NA	1512	84.189766
11	ACOT8	NA	10005	83.24717

```
1
```

```
2
```

```
3
```

```
4 list(gene = c("ENSG00000224740", "ENSG00000223654", "ENSG00000230143", "ENSG00000236271"
```

```
5
```

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```
6
7
8
9
10
11

> out$ensembl[[4]]$gene

[1] "ENSG00000224740" "ENSG00000223654" "ENSG00000230143" "ENSG00000236271"
[5] "ENSG00000206480" "ENSG00000206379" "ENSG00000232280" "ENSG00000137312"
```

5.3 When an input has no matching gene

In case that an input id has no matching gene, you will be notified from the output. The returned list for this query term contains `notfound` value as `True`.

```
> xli <- c('DDX26B',
+         'CCDC83',
+         'MAST3',
+         'FLOT1',
+         'RPL11',
+         'Gm10494')
> queryMany(xli, scopes="symbol", fields="entrezgene", species="human")
```

Finished

Pass `returnall=TRUE` to return lists of duplicate or missing query terms.

DataFrame with 6 rows and 5 columns

	query	notfound	_id	X_score	entrezgene
	<character>	<logical>	<character>	<numeric>	<character>
1	DDX26B	TRUE	NA	NA	NA
2	CCDC83	NA	220047	88.68985	220047
3	MAST3	NA	23031	86.48055	23031
4	FLOT1	NA	10211	90.25903	10211
5	RPL11	NA	6135	82.61896	6135
6	Gm10494	TRUE	NA	NA	NA

5.4 When input ids are not just symbols

```
> xli <- c('DDX26B',
+         'CCDC83',
+         'MAST3',
+         'FLOT1',
+         'RPL11',
+         'Gm10494',
+         '1007_s_at',
+         'AK125780')
>
```

Above id list contains symbols, reporters and accession numbers, and supposedly we want to get back both Entrez gene ids and uniprot ids. Parameters `scopes`, `fields`, `species` are all flexible enough to support multiple values, either a list or a comma-separated string:

```
> out <- queryMany(xli, scopes=c("symbol", "reporter", "accession"),
+                 fields=c("entrezgene", "uniprot"), species="human")
```

Finished

Pass `returnall=TRUE` to return lists of duplicate or missing query terms.

```
> out
```

DataFrame with 9 rows and 7 columns

	query	notfound	_id	X_score	entrezgene	uniprot.Swiss.Prot
	<character>	<logical>	<character>	<numeric>	<character>	<character>
1	DDX26B	TRUE	NA	NA	NA	NA
2	CCDC83	NA	220047	88.87774	220047	Q8IWF9
3	MAST3	NA	23031	86.48462	23031	060307
4	FLOT1	NA	10211	90.25903	10211	075955
5	RPL11	NA	6135	82.61896	6135	P62913
6	Gm10494	TRUE	NA	NA	NA	NA
7	1007_s_at	NA	100616237	11.631466	100616237	NA
8	1007_s_at	NA	780	11.273753	780	Q08345
9	AK125780	NA	2978	13.158991	2978	P43080

```
1
2
3
4
```

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```
5
6
7
8 c("A0A024RCJ0", "A0A024RCL1", "A0A024RCQ1", "A0A0A0MSX3", "Q96T61", "Q96T62", "A0A0G2JIA")
9
> out$uniprot.Swiss.Prot[[5]]
[1] "P62913"
```

5.5 When an input id has multiple matching genes

From the previous result, you may have noticed that query term `1007_s_at` matches two genes. In that case, you will be notified from the output, and the returned result will include both matching genes.

By passing `returnall=TRUE`, you will get both duplicate or missing query terms

```
> queryMany(xli, scopes=c("symbol", "reporter", "accession"),
+           fields=c("entrezgene", "uniprot"), species='human', returnall=TRUE)
```

Finished

\$response

DataFrame with 9 rows and 7 columns

	query	notfound	_id	X_score	entrezgene	uniprot.Swiss.Prot
	<character>	<logical>	<character>	<numeric>	<character>	<character>
1	DDX26B	TRUE	NA	NA	NA	NA
2	CCDC83	NA	220047	88.68985	220047	Q8IWF9
3	MAST3	NA	23031	86.671196	23031	060307
4	FL0T1	NA	10211	89.66981	10211	075955
5	RPL11	NA	6135	82.72622	6135	P62913
6	Gm10494	TRUE	NA	NA	NA	NA
7	1007_s_at	NA	100616237	11.526207	100616237	NA
8	1007_s_at	NA	780	11.344912	780	Q08345
9	AK125780	NA	2978	13.326442	2978	P43080

```
1
2
3
4
5
```

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```
6
7
8 c("A0A024RCJ0", "A0A024RCL1", "A0A024RCQ1", "A0A0A0MSX3", "Q96T61", "Q96T62", "A0A0G2JIA")
9

$duplicates
  X1007_s_at
1           2

$missing
[1] "DDX26B" "Gm10494"
```

The returned result above contains `out` for mapping output, `missing` for missing query terms (a list), and `dup` for query terms with multiple matches (including the number of matches).

5.6 Can I convert a very large list of ids?

Yes, you can. If you pass an id list (i.e., `xli` above) larger than 1000 ids, we will do the id mapping in-batch with 1000 ids at a time, and then concatenate the results all together for you. So, from the user-end, it's exactly the same as passing a shorter list. You don't need to worry about saturating our backend servers. Large lists, however, may take a while longer to query, so please wait patiently.

6 References

Wu C, MacLeod I, Su AI (2013) BioGPS and MyGene.info: organizing online, gene-centric information. *Nucl. Acids Res.* 41(D1): D561-D565. help@mygene.info