

MyGene.info R Client

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April 28, 2020

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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   24.1819         1017
2          1018      1018   24.1816         1018
3 ENSG00000148795      1586   22.8137         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] 440.2867

$took
[1] 13

$total
[1] 916

$hits
      _id  _score  entrezgene      name  symbol  taxid
1      1017 440.2867      1017 cyclin dependent kinase 2      CDK2  9606
2     12566 372.5758     12566 cyclin-dependent kinase 2      Cdk2 10090
3     362817 312.4615     362817 cyclin dependent kinase 2      Cdk2 10116
4 ENSOABG00000013079 286.5968      <NA> cyclin-dependent kinase 2      cdk2 47969
5     100592796 286.5968 100592796 cyclin dependent kinase 2      CDK2 61853

```

```

> query(q="NM_013993")

$max_score
[1] 7.549415

```

```
$took
[1] 8

$total
[1] 1

$hits
  _id  _score entrezgene          name symbol
1 780 7.549415      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		
	<character>	<character>	<numeric>	<character>		
1	1053_at	5982	13.1638	5982		
2	117_at	3310	13.1367	3310		
3	121_at	7849	13.1367	7849		
4	1255_g_at	2978	13.1638	2978		
5	1294_at	7318	13.1638	7318		
6	1294_at	100847079	13.1570	100847079		

		name	symbol	taxid
		<character>	<character>	<integer>
1		replication factor C subunit 2	RFC2	9606
2	heat shock protein family A (Hsp70) member 6		HSPA6	9606
3		paired box 8	PAX8	9606
4		guanylate cyclase activator 1A	GUCA1A	9606
5	ubiquitin like modifier activating enzyme 7		UBA7	9606
6		microRNA 5193	MIR5193	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	78921059-78945046	-	16	NM_004390
[17]	20	45841720-45857392	-	17	NM_005469

seqinfo: 7 sequences from an unspecified genome; no seqlengths

`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	89.2326	220047
3	MAST3	NA	23031	89.7272	23031
4	FLOT1	NA	10211	91.0142	10211
5	RPL11	NA	6135	82.8755	6135
6	ZDHHC20	NA	253832	89.2326	253832
7	LUC7L3	NA	51747	87.2761	51747
8	SNORD49A	NA	ENSG00000277370	103.0028	NA

9	SNORD49A	NA	26800	100.9490	26800
10	CTSH	NA	1512	87.6581	1512
11	ACOT8	NA	10005	87.9893	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	89.2326
3	MAST3	NA	23031	89.7272
4	FL0T1	NA	10211	91.0142
5	RPL11	NA	6135	82.8755
6	ZDHHC20	NA	253832	89.2326
7	LUC7L3	NA	51747	87.2761
8	SNORD49A	NA	ENSG000000277370	103.0028
9	SNORD49A	NA	26800	100.9490
10	CTSH	NA	1512	87.6581
11	ACOT8	NA	10005	87.9893

ensembl
<list>

1	
2	ENSG000000150676
3	ENSG000000099308
4	ENSG000000223654, ENSG000000206480, ENSG000000224740
5	ENSG000000142676
6	ENSG000000180776
7	ENSG000000108848
8	ENSG000000277370
9	
10	ENSG000000103811
11	ENSG000000101473

```
> out$ensembl[[4]]$gene
[1] "ENSG00000223654" "ENSG00000206480" "ENSG00000224740" "ENSG00000230143"
[5] "ENSG00000137312" "ENSG00000232280" "ENSG00000206379" "ENSG00000236271"
```

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	89.2326	220047
3	MAST3	NA	23031	89.7272	23031
4	FLOT1	NA	10211	91.0142	10211
5	RPL11	NA	6135	82.8755	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')
>
```


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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    89.2326    220047      Q8IWF9
3      MAST3        NA      23031    89.7272    23031      060307
4      FLOT1        NA     10211    91.0142    10211      075955
5      RPL11        NA      6135    82.8755     6135      P62913
6    Gm10494      TRUE        NA        NA        NA            NA
7  1007_s_at       NA       780    13.1638     780      Q08345
8  1007_s_at       NA  100616237    13.1570  100616237        NA
9   AK125780       NA      2978    16.2995     2978      P43080

      uniprot.TrEMBL
      <list>
1
2
3
4      A2AB10,Q5ST80,A2AB09,...
5      Q5VVC8,Q5VVD0,A0A2R8Y447
6
7  A0A0A0MSX3,A0A024RCJ0,A0A024RCL1,...
8
9      A0A0A0MTF5,B2R9P6

> 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	89.2326	220047	Q8IWF9
3	MAST3	NA	23031	89.7272	23031	060307
4	FL0T1	NA	10211	91.0142	10211	075955
5	RPL11	NA	6135	82.8755	6135	P62913
6	Gm10494	TRUE	NA	NA	NA	NA
7	1007_s_at	NA	780	13.1638	780	Q08345
8	1007_s_at	NA	100616237	13.1570	100616237	NA
9	AK125780	NA	2978	16.2995	2978	P43080

uniprot.TrEMBL

<list>

```
1
2
3
4
5
6
7 A0A0A0MSX3, A0A024RCJ0, A0A024RCL1, ...
8
9 A0A0A0MTF5, B2R9P6
```

\$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