Implementing a simple REST API assignment by Donato Scarano (2582 words)

Requirements

- python3.8+ , virtualenv

Installation

- Enter to the project directory by running `cd project_bio` command
- Create a new virtual environment by running `virtualenv -p python3 venv` command
- Activate `venv` by using `source venv/bin/activate` command or if in Windows: venv\Scripts\activate
- When you have activated `venv` then install external packages by using `pip install -r requirements.txt` command

Migrations and Loading Dataset into Database

Migrations

```
$ python manage.py makemigrations
# Migrations for 'api':
#  api/migrations/0001_initial.py
#    - Create model Organism
#    - Create model ProteinFamily
#    - Create model Taxonomy
#    - Create model Protein
#    - Add field taxonomy to organism
#    - Create model Domain

$ python manage.py migrate
# Operations to perform:
#  Apply all migrations: admin, api, auth, contenttypes, sessions
# Running migrations:
#  Applying contenttypes.0001_initial... OK
#  Applying auth.0001_initial... OK
#  Applying admin.0001_initial... OK
#  Applying admin.0002_logentry_remove_auto_add... OK
#  Applying admin.0003_logentry_add_action_flag_choices... OK
#  Applying api.0001_initial... OK
#  Applying contenttypes.0002_remove_content_type_name... OK
#  Applying auth.0002_alter_permission_name_max_length... OK
#  Applying auth.0003_alter_user_email_max_length... OK
#  Applying auth.0004_alter_user_username_opts... OK
#  Applying auth.0005_alter_user_last_login_null... OK
#  Applying auth.0006_require_contenttypes_0002... OK
#  Applying auth.0007_alter_validators_add_error_messages... OK
#  Applying auth.0008_alter_user_username_max_length... OK
#  Applying auth.0009_alter_user_last_name_max_length... OK
#  Applying auth.0010_alter_group_name_max_length... OK
#  Applying auth.0011_update_proxy_permissions... OK
#  Applying auth.0012_alter_user_first_name_max_length... OK
```

```
#  Applying sessions.0001_initial... OK
```

Load dataset

Important!!!
data_set.csv and data_sequences.csv files must be inside project_bio/

for example if you run `ls` command inside project_bio/ you should see the below files & folders:

```
$ ls
api core  data_sequences.csv  data_set.csv  db.sqlite3  dev-requirements.txt  manage.py
requirements.txt  src  venv pfam_descriptions.csv
```

The location of the python code for loading the provided CSV data into the database is found in the api folder under the management\commands subfolder and it is called load_dataset.py

Run below command to load data from csv into database:

```
$ python manage.py load_dataset
#  [2022-06-05 22:40:46] Process started...
#  While storing dataset into database please wait...
#  This can take a few minutes...
#  Protein count  : 9988
#  Domain count   : 10000
#  Organism count : 1995
#  ProteinFamily count : 2453
#  Taxonomy count : 1995
#  [2022-06-05 22:42:45] Process finished...
```

** This will take a few minutes... **

Run project

Activate `venv` inside `project_bio`

Use the following command to start the server:

```
$ python manage.py runserver

# Watching for file changes with StatReloader
# Performing system checks...

# System check identified no issues (0 silenced).
# June 05, 2022 - 12:11:32
# Django version 3.2.13, using settings 'src.settings'
# Starting development server at http://127.0.0.1:8000/
# Quit the server with CONTROL-C.
```

Run Unit Tests

Activate `venv` inside `project_bio`

```
$ python manage.py test
# Creating test database for alias 'default'...
# System check identified no issues (0 silenced).
# .................
# ----------------------------------------------------------------------
# Ran 17 tests in 0.102s

# OK
# Destroying test database for alias 'default'...
```

API Usage

Overview Endpoints

Below is a table with each endpoint and its description based on the rest specifications indicated in the file rest_specification_and_examples.txt

#	Endpoint	Description
1	/api/proteins/	Accept HTTP GET request to list proteins and POST request to add new protein.
2	/api/proteins/protein_id/	Accept HTTP GET request to see protein detail. PUT request to update a protein.
3	/api/taxonomies/	Accept HTTP GET request to list taxonomies and POST request to add new taxonomy.
4	/api/taxonomies/tax_id/	Accept HTTP GET request to see taxonomy detail. PUT request to update a taxonomy.
5	/api/organisms/	Accept HTTP GET request to list organism and POST request to add new organism.
6	/api/organisms/pk/	Accept HTTP GET request to see organism detail. PUT request to update a organism.
7	/api/protein-families/	Accept HTTP GET request to list protein families and POST request to add new protein family.
8	/api/protein-families/pf_id/	Accept HTTP GET request to see protein family detail. PUT request to update a protein family.
9	/api/domains/	Accept HTTP GET request to list domains and POST request to add new domain.
10	/api/domains/pk/	Accept HTTP GET request to see domain detail. PUT request to update a domain.
11	/api/coverage/protein_id/	Return the domain coverage for a given protein. That is Sum of the protein domain lengths (start-stop)/length of protein.

1. `/api/proteins/` Endpoint
- Example ` http://127.0.0.1:8000/api/proteins/ ` Http GET request
- Response

```json
{
   "next": " http://127.0.0.1:8000/api/proteins/?page=2 ",
   " previous ": null,
   " count ": 9989,
   " total_pages ": 999,
```

```
" current_page ": 1,
" results ": [
    {
      " id ": 1,
      " length_of_sequence ": 338,
      " protein_id ": " A0A014PQC0 ",
      " sequence ": "
MAPVKVGINGFGRIGRIVFRNAAEHPEIEVVAVNDPFIDTEYAAYMLKYDSSHGIFKGDIKK
EADGLVVNGKKVKFFTERDPSAIPWKSAGAEYIVESTGVFTTTDKAKAHLAGGAKKVVIS
APSADAPMYVMGVNEKTYDGKADVISNASCTTNCLAPLAKVIHDKFTIVEGLMTTVHSYT
ATQKTVDGPSGKDWRGGRGAAQNIIPSSTGAAKAVGKVIPDLNGKLTGMSMRVPTANVSV
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    {
      " id ": 2,
      " length_of_sequence ": 101,
      " protein_id ": " A0A016S8J7 ",
      " sequence ": "
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ALYHTVKRLGIPDSNIILMLAEDVPCNPRNPRPEAAVLSA ",
      " organism ": 2
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      " id ": 3,
      " length_of_sequence ": 194,
      " protein_id ": " A0A016SK08 ",
      " sequence ": "
METTLFNAPINIPVSKGVKQGDTISPKLFSAGLEMVIRKLNLEKGINIDGEHLTHLRFADDLV
LPGEDADTVQKMLRELEIEGRKVGLKINRLKTKIMRSHCAPKMTITLKGEIIEEGGSYVYLG
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    {
      " id ": 4,
      " length_of_sequence ": 733,
      " protein_id ": " A0A016SLU4 ",
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GHTHKWVCTIELPIEVNGIDRAVTAQATVSTSKKDAQVQCALEACRILDAHGVLRRSTTKS
RQKNKDLEANDFYDEDDDEYLDRTGQIEKQREKRMMWAKNQGGGKVEKKSTYESLCKE
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HDAQRLEKLVKIAKPVALPELKVAGTKTSGADKQAFLRKMMMLGRKKAADEKAAEKAEE
KGMQGPAGLPSAVEAFKPELEEEEETAKASDEKPSSSNTVENAAAAEKAPSSSPVREKEQT
VVESKSAEEKAPETPVVASKSHNPIPSGSTTSNPTPTKTKQQIVHEIVHGDEDERLNTSKRSL
```

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" id ": 5,
" length_of_sequence ": 865,
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QVPGDKKEEKAEAKSQEKAESKTEGPEEKKDEKVEKSGSATPRTPSSPPNTPKYGMEDEDR
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SAKTSEHRREQDAEMRKETRTAPTFGVGARCPMSSSRGLYSRLPFDYTDNGEVRGKDLYD
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ARYEGCTRYDPYEDLFDAMKQNNAMLKKDEKVKNNRESRVGEKKSTEIKQKRAADSTEL
GIERDRENDVRRRAEKFLEEVSGRKKNSLPAEEGLKAAVEEAAREPNGRDGRDTNCRCFVT
KWGRSEIRSQTCPACQAKVMRSEQSSSRYAYMRGMSDEAVPAAEEQIERKREINEPETKVD
VKQDVLEPKCKHFVELPLEQDTVLVAKVDELRVLLYSVAAAELRRDLVDPLIQTYSLRILLP
GPATTLQLPKAADSYDHCCSTDGSSDSDSDFEALSYESIPDEFEKEKHTCEIATAPPVEQGTA
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CMEQNKEQIALKETVVKKVFDFEKSVTGKDNTESINLRMDRTMQVKQALLEKANLTNVVT
AADNGVFDKDVLLTEKQAHFLLNELGKAGVGSDVPPPGVGGSAKFKRASVFFEENPVQK
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EPPEQESEWLALCKKDPEYSKILEWLRRGEMDHEIKLPRMKKTLAVADFCIADGDLQLITQ
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SEKEFDVQDEMHFLHGKFRCMGQPFPVMPDHPGLTPDVGTRCRCSTSIKAMDLIPSLPAPA
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}
```

- There is pagination for performance in API. By calling `proteins` endpoint with `page` Http parameter you get 10 proteins in every page. To get next 10 proteins make a request ` http://127.0.0.1:8000/api/proteins/?page=2 `

- Example ` http://127.0.0.1:8000/api/proteins/ ` Http POST request
- with request body ( payload )
```json
{
" length_of_sequence ": 9,
" protein_id ": " ABCD1 ",
" sequence ": " XYZQWERTY ",
" organism ": 1
}
```

- In request body (payload) we give ` organism ` pk(id) to make a relationship with organism and protein model (table).
- ** Response ** with HTTP 201 status code
```json

```
{
   " length_of_sequence ": 9,
   " protein_id ": " ABCD1 ",
   " sequence ": " XYZQWERTY ",
   " organism ": 1
}
```


Filter proteins by TAXID

- Example ` http://127.0.0.1:8000/api/proteins/?taxid=55661 `
- Response


```json
{
   " next ": " http://127.0.0.1:8000/api/proteins/?page=2&taxid=55661 ",
   " previous ": null,
   " count ": 12,
   " total_pages ": 2,
   " current_page ": 1,
   " results ": [
      {
         " id ": 690,
         " length_of_sequence ": 611,
         " protein_id ": " A0A091FMY9 ",
         " sequence ": "
SFSSSDLNSNGFICDYELHELFKEANLPLPGYKVREIIQKLMIDGDKNKDGKISFEEFVYIFQ
EVKSSDIAKTFRKAINRKEGICAIGGTSELSSEGTQHSYSEEEKYAFVNWINKALENDPDCR
HVVPMNPNTDDLFKAVGDGIVLCKMINLSVPDTIDERAINKKKLTPFIIQENLNLALNSASAI
GCHVVNIGAEDLREGKPHLVLGLLWQIIKIGLFADIELSRNEALAALLRDGENLEDLMKLSP
EELLLRWANFHLENAGWHKINNFSSDIKDSRAYFHLLNQIAPKGQKEGEPQIDINMSGFNEK
DDLRRAEYMLQQADRLGCRQFVTPADVVSGNPKLNLAFVANLFNKYPALTKPENQDIDWT
LLEGETREERTFRNWMNSLGVNPHVNHLYGDLQDALVILQLYEKIKVPVDWNKVNKPPYP
KLGANMKKLENCNYAVDLGKHPAKFSLVGIGGQDLNDGNPTLTLALVWQLMRRYTLNVL
EDLGDGQKANDDIIVSWVNQTLKEAGKSTSIQNFKDKTISTSLAVVDLIDAIQPGCINYDLV
MTGNLSEDDKQNNAKYAVSMARRIGARVYALPEDLVEVKPKMVMTVFACLMGRGMKRV
",
         " organism ": 119
      },
      {
         " id ": 691,
         " length_of_sequence ": 427,
         " protein_id ": " A0A091FQA9 ",
         " sequence ": "
KLEGSKCRGQLLIFGATNWDLIGRKEVPKQQVAYRNLGQNLWGPHRYGCLSGIQVRSVVS
GPCAAHSLLITAEGKLWSWGRNEKGQLGHGDTKRVEAPKLIEVLGSEAIVLAACGRNHTL
ALTESGSVFAFGENKMGQLGLGNQTDAVPSPAQIMYNGQPITKLACGAEFSMIMDCKGNLY
SFGCPEYGQLGHNSDGKFIARAQRIEYDCELVPRRVAIFIEKTKDGQILPVPNVVVRDVACG
ANHTLVLDSQKRVFSWGFGGYGRLGHAEQKDEMVPRLVKLFDFPGRGAAQIYAGYTCSFA
VSETGGLFFWGATNTSRESTMYPKAVQDLCGWKIRSLACGKSSIIVAADESTISWGPSPTFG
ELGYGDHKPKSSTAAQEVKTLDGIYTEQVAMGYAHSLVIARDETDAEKEKLRKLPEYNPRT
I ",
         " organism ": 119
      },
      {
```

" id ": 692,
" length_of_sequence ": 917,
" protein_id ": " A0A091FRU1 ",
" sequence ": "
QILSSKSDSRLKHLLQRAPEYCPESMGEVWGCINSSLPGVLKKSDGWVGLGCCELAIAAEC
RQACKQASAKNDVLKLCRKEYENALFSCINRNEMGSVCCSYAGHHTNCREYCQAIFRTDS
SPGPSQIKAVENYCASISPQLIHCVNNYTHSYPMRNPTDSLYCCDRAEDYACQTACKRILMS
MKTELEIVDGLIEGCKTMPLPQDPLWQCFLESSRSVHPGVTVHPPPSTGLDGAKLHCCSKA
NSSTCRELCTKLYSTSWGNSQSWQEFDRFCEYNAVEVSMLTCLADVREPCQLGCRNLTYCT
NFNNRPTELFRSCNTQSDQGAMNDMKLWEKGSIKMPFINIPVLDIKKCQPEMWKAIACSLQ
IKPCHSKSRGSIICKSDCVEILKKCGDHNKFPEGHSAESICELLSPTDDLENCIPLDTYLSPSSL
GNIVEDVTHPCNPNPCPTNQLCEVNRKGCQSGELCLPYLCVPGCKLGEASDFIVRQGTLIQ
VPSSAGDVGCYKICTCGHSGLLENCMEMRCVDLQKSCIVGGQRKSHGTSFNIDCNVCSCFA
GNLVCSTRQCLTEHSSEDERRKFTGLPCNCVDQFVPVCGQNGRTYPSACIARCVGLQDNQF
EFGSCISKDPCNPNPCNKNQRCVPKKQVCLTSFGKFECSQHECVPRQLNCDQTRDPVCDTE
NVEYSNLCTLYQKGKSLAYRGPCQPFCKLVEPVCGHNGETYSSVCAAYSDRVAVDYYGPC
QAVGVLSDYGFHTECAFVKCPPLSATGCKPVVAPGACCPLCAGMLRILYDKDKLDTFARVT
NKKPITVLDILEKIRLHVSVPQCDVFGYLSIESEIVILIIPVDQNPKPLQIEACNKEAEKIESLIN
SDSPTLASHVPLSALIASQVQVSFSISSPSVKVMPILHSLFISILFTLSGLIYYI ",
" organism ": 119
},
{
" id ": 693,
" length_of_sequence ": 1624,
" protein_id ": " A0A091FUC2 ",
" sequence ": "
TAVWNFVRTSEHHLPLQIGETVHISPASEGWYHGYSLRNRAARGIFPASLIHLKGAVVERRG
VLPAEMPMVQEITTTLREWAAIWKQLYVVSTGGRGGWGSAGTRGHSAVPPAGRAAGARQ
VKRMMCELMERRSQLLSGTLPKDELLQLKREVTSRIDYGNKILALDLAVRDEDENILDPDR
TSVTSLFQAHKKAAQTLTQRIPEELPHAPQSPQQSVLSCSARHAASPSHSLYLCVRNFVCNI
GEEAQLLMALYDPGQQRSVSENYVIRWSSTGVPQDLELLNNLKVIFTDLGSNDLKRERLFL
VCQIIRVGRMDLRESYSRKLSTGLRRPFGISVMDITDITKGKCESDEDKQHFIPVHLATADND
FLHNMIRKAMEGKDINHKGQGFWVSLKMLWGDLSQVRKDHPHLVDRSTVVARKLGYPEV
IMPGKLRRDIRNDIYLTLVQGEFDKGNKKTQKNVEVTVCVCDEAGSVVKNVIYHGAGDKP
ASEYRSVVYYQQRHQRWMETVKIAVPIEDVHKTHLRFTFRHRSSSDSKDKSERIFSMAFVK
LMQVDGTTLRDGEHDLVLYKGDSRKLEDAAAYLTLPSIRNVSEPKLLSGSSFRVSGTASGLT
VSTRDSFQISTLICSTKLTQNVNLLGLLKWRSKPSLLAGNLQKLMHVDGGEVIKFLQDTLD
ALFSIMMENSDTDVYDTLVFDALVFIVGLVADRKFQHFNAVLEAYIHQHFSATLAYKKLLSV
LTQYVEQVSRGEPCELLMRTFKALEYVFKFIVRSRHLFAQLYEGKETAEFQRSLQSFFLSLN
QLMKSPLEGPTLLAQGAALKYLPSILEDVFGIFDSSVLGALLRDFIGNLPPQRLLKQKLQSLT
DIVNSKAFQSYECRELLLQTAVPTLQELIQRGEEEDVCIELLSNILEVLYKAQKVQVKKHIQL
ILERLLHTVNRRVIVLDRENSLRSHYVACMAAILSQMDKDHYSSYIRAFPSRPELMDFLMET
FILFKDLIGKTVYPSDWMVMNMVQNREFLHAINLFATTLMEKFLSNSSFELQLWNNYFHLA
VAFLTQESLQLENFSQAKRSRILAKYGDMRAAIGASIRDMWYSLGHRKIEFIPGMVGPILEM
TLVPELELRKSTIPIFFDMMLCEYQLTRSFSRFEDEILRKLDSEVEGGRGDEQYKQLFESILLS
CCQQHPELAKPGENFVALVTGLLERLLDYRAVMNDENKTYSMSCTVNLLNFYKEIDRQAM
YIRYLYKLRDLHVSYENYTEGAYTLLLHARLLKWSDEATAAPVQGSHSPRLHTQRQLKESL
YNQIIDYFDRGKMWEEAILICKELAEQYESEVFDYEMLSDILQREASFYEKILKVLRPSPDYF
AVGYYGQGFPTFLRNKVFIYRGKEYERREDFEMRLLSPFPNAEKLKSTSPPGQDITGSPGQY
IQCFTVQPAEEANVRFKDRSVPEQITNFYKANHIQKFSYSRPFQKGPKDPDNEFATMWIERT
TFVTAYPLPGILRWFVVTSTTTTTISPLENAIETMMRTNEKIRSEINRHQNDPSLAVNPLSMLL

NGIVDPAVMGGFAKYETAFFQESYLQEHPEDVGNVERLKDLIAWQTPLLAEGIRIHGRKVT
EDLRPFHERMEQCFVQLQAKV ",
" organism ": 119
},
{
" id ": 694,
" length_of_sequence ": 357,
" protein_id ": " A0A091FX61 ",
" sequence ": "
AKLARRSQERENLGMLVWSPNQNLSEAKLDEYIAIAKEKHGYNMEQALGMLFWHKHNIE
KSLADLPNFTPFPDEWTVEDKVLFEQAFSFHGKTFHRIQQMLPDKSIASLVKFYYSWKKTR
TKTSVMDRHARKQKREREESEDEMEEANGNNPIDIEVEQNKESKKEVPPTETVPQVKKEK
HSTQAKNRAKRKPPKGMFLSQEDVEAVSANATAATTVLRQLDMELVSIKRQIQNIKQTNSA
LKEKLEGGIEQYRLPEVVQKFNARWTTDEQLLAVQAIRKYGRDFQAISDVIGNKSVVQVKN
FFVNYRRRFNIDEVLQEWEAEHGKEETNGTNSQKPVKSPDNSTKMSEEEDEVNPI ",
" organism ": 119
},
{
" id ": 695,
" length_of_sequence ": 667,
" protein_id ": " A0A091FY39 ",
" sequence ": "
QWLSDRKKRALQKKDVDIRRRIELIQDFEMPTVCTKIKVSRDGQYVMAAGTYKPRIRCYD
TYQLSQKFERCLDSEVVTFEILSDDYSKIVFLQCGRFVEFHSQHGHYYKTRIPKFGRDFSYH
YPSCDLYFVGASSEVYRLNLEQGRFLNSLQTDASESNVCDINPVHFLFAMGTAEGKVECWD
PRTRNRVGLLDCALNSVTADTEIEGLPSISALKFDGALNMAVGTSTGQVLLYDLRSSNPLIV
KDHHYGLPIKSIQFQHQLDLIISADSRIIKMWNKDTGKIFTSMEPEHDINDVCLYPNSGMLM
TANEAPKMNIYYIPVLGPAPKWCSFLDNLTEELEENPESTVYDDYKFVTRKDLENLGLAHLI
GSSLLRAYMHGFFMDIRLYHKAKMMANPFAYEEYRREKIRQKIEETRAQRVQLKKLPKVN
KELALKLIEEEGEEQQVARKRKQKNLPSLLKDDRFKVMFENPDFQVDEQSEEFRLLNPLVS
KISEKRKRKLKLLEELEAQEQEEEEEPEGKASDAESSESSDDEKGWVEEVRKQRKLLRQEE
KVKRQERFKEDQQTLLKPQFFEIKEGEEFRSFKDSAKKQKLMKKTLGDRLKLEEKLGTLD
VSDTTVGSKQATFKLKKSEQQRKQQEAEKQHRQERKILRRSASHLKSKRGRGRLFH ",
" organism ": 119
},
{
" id ": 696,
" length_of_sequence ": 954,
" protein_id ": " A0A091G8V7 ",
" sequence ": "
MASTQEHLSLSSSPNSIGKAFCEDKDFSVLHNEHVPAGNHPSPELIEDVREKGLLQGDLIEN
MSSPVTAAVLTSISEDSRDQFENSVLQLREQDELETAIPQGNRNTTDGESNSGADDVKVQFN
RSGSGSGGFLEGLFGCLRPVWNIIGKAYSTDYKLQQQDTWEVPFEEISELQWLGSGAQGAV
FLGKFRAEEVAIKKVRDQNETDIKHLRKLKHPNIIAFKGVCTQAPCYCIIMEYCAHGQLYEV
LRAGRKVTPRLLVDWSTGIASGMNYLHLHKIIHRDLKSPNVLVTHTDAVKISDFGTSKELSD
KSTKMSFAGTVAWMAPEVIRNEPVSEKVDIWSFGVVLWELLTGEIPYKDVDSSAIIWGVGS
NSLHLPVPSTCPDGFKILMKQTWQSKPRNRPSFRQTLMHLDIASADVLATPQETYFKSQAE
WREEVKKHFEKIKSEGTCIHRLDEELIRRRREELRHALDIREHYERKLERANNLYMELSAIM
LQLEVREKELIKREQAVEKKYPGTYKRHPVRPIIHPNTVEKLMKRKGVSHKPGSQTKRPDL
LKSEGIPSTEAASNGSPVSGSPKMSTPSGKSRYRSKPRHRRGNSKGSYNDFAGILKNQPVQD
DAPPSPPHNHSPHPSLPQPGHSHPHGHHSRLHAHGQDIANCANNLRYFGPAAALRSPLSNH
AQRQMSGSSPDLISAAMEVDCRRNLESKESKADHWECCKTVPYDSCLQCRGEDSSQVQIS

SAETGMSRSQSPTSISLYENVQFISKLEEEGFSSSKSASALGTPQHMASSVLPCKARPLQKSG
DDSSEEEEGEVDSEVEFPRRQRPHRCISSCQSYSTFSSENFSVSDGEEGNTSDHSNSPDELAT
KLEDELAEKLEDMLSQTPEIPIEISTQSDGLSDKECAVRRVKTQMSLGKLCADEHGCENPAQ
FGESDCDSSEGECSDATVRTNKPCSSATW ",
" organism ": 119
},
{
" id ": 697,
" length_of_sequence ": 1423,
" protein_id ": " A0A091GCF7 ",
" sequence ": "
MSEVQGTVEFSVELHKFHNVDLFQGGYYQIRAGLKIPSRIPHRLFATITGQTGDSSLCSACV
HENNVYSRIFQILYRNEEIVLNESMNFRVHLLLDGERVEDALSEADFQLKLDLHFTDSEQQL
RDIPAIPMISSRTMCLHFHARRGLHHHVPVMFDYFHLSVISVTVHASLVALHQPLISFTRPGK
GSWLGKGNLEVGPDQSSMSLENLVFGAGYCKPTSSEGSFYVPSENCMQHAYKWHKDLCL
LLLNAQKGLHMYYTLIMKEIPDLPQLKLEELSVEETLSQLFTELQLLSNPEKTAEQISKDLT
WLCSHLLALWTQFLEVVTLHPEVTAYLAQEHHMLRVRRFSEAFFYTEHQKVDALTFQEGLI
QSHGQISTEIRNSEYFTSMPPLPAECLEIDGDWNTLPVIFEDRYMDMPCKDQNLEVFPDFEA
SENTETDVMDDSEYLTSNDATAVMKGDIGKGTLLIHTDRINKNPSCMYSSTEGAAYTPKGL
NQHSTSQVCTANKEDQRKHENIFVSSKGTTFDSEKGNTECTSEDFKTPMEVLLKDNTFVAD
VNYGDMKPSNKDSHKSETMLNVSAQYEGETFRTDGLEDRTEIQEIYESSHPENNFTSSDLA
LNELTSLEKTENPDNKALLPVLKTMPTNTFEVKLFTKEQRGEESEEFTLTSGVIKRSSSVISD
SGIESEPSSVAWSDARRRALELPSDREILHHLVRRHVIHRNSLEGGHTESNTSLPSGIQASLTS
ISSLPFEEEEREMELTKLTKSVSAPQISSPEEPVEEVDISKHSEVISGGSGGNFKSCTETEDGD
GQLVMNFSRCQATNESGQLEPRGHLKPSVEHSSNNIHLQGEEVKEGFPETYCSLESARLPVC
PKLLRDNVSECQSLESNDECSLKTPSVCNYLDKNMDKFDTCIEDPKDKLKPHNLKIQQGFY
SNNRTSGEESFSERVKLEADFHYSVPAPSESSTEFGSMQGECGSSLAAESPAVYAEMPALQEI
ELNDSPASADPAAGSYQAECPKEPDSREHKLQANGTDFHSATTEGVALESRKAVDVVNLSV
SCTATCLPFSSVLKETPAVVGFSTKQAAFPITRQPLGSFGVVSSDSNEVDEEINERMLNFYQA
KEKFKKEMKIEGFLYSDLSVLASDIPYFPPEEEEENLEDGIHLVVCVHGLDGNSADLRLVKT
FIELGLPGGNLDFLMSERNQTDTFADFDTMTDRLLDEIIQHIQLYNLSISRISFIGHSLGNVIIR
SVLTRPRFRYYLNKLHTFLSLSGPHLGTLYNNSTLVSTGLWLMQKLKKSGSLLQLTFRDNA
DLRKCFLYQLSQKTGLQYFKNVVLVASPQDRYVPFHSARIEMCKNALKDRHTGPVYAEMI
NNLLQPLIGAKDCTLIRHNVFHALPNTANTLIGRAAHIAVLDSELFLEKFFLVAGLNYFK ",
" organism ": 119
},
{
" id ": 698,
" length_of_sequence ": 231,
" protein_id ": " A0A091GK66 ",
" sequence ": "
RNISAARQPVKHDTEKNKAQWKTMGPAKVAVPSQKNFLKKHSKEPKLPERKKEQDSKKLP
ALSVPQRTYHPVTEIQNRKNFINANVVAAVTALPKKPQPIYVDRRQGDKYLLETSGLVPKYI
KKKDYGVTPKYVTQRNEEKKRAQKEYEASILEHLQKVAMKQLSDEERTSLLQGLKKNWE
ELYREFQCLPVEIDTILKRLYKEKLESQMRQLEHDIEVIEKHKVIYIANE ",
" organism ": 119
},
{
" id ": 699,
" length_of_sequence ": 1309,
" protein_id ": " A0A091GM81 ",

```
        " sequence ": "
NVTLPEDNQPVVFNHVYNIKLPVGSLCSVDLDTASGDADLKAEIEPVKNYEEHTVNEGNQI
VFTHRINIPRRACGCAAAPDIKDLLSRLEELEGLVSSLREQCASGPGCCPNSQAVEGRLDTTP
YCNGHGNYSIEICGCICEPGWKGPNCSEPVCPQNCFNHGLCVQGKCICNEGFTGEDCGELR
CPEDCHNRGRCVEGRCECDNGFTGVDCSELSCPNDCHQHGRCIDGRCVCHEGFMGEDCSE
RSCPNDCSNAGRCIDGQCVCEDGYMGDDCSDVSPPTQLTVTNVTDKTVNLEWKHENVVN
EYLITYVPTSSGGLDMQFTVPGNQTAATIHELEPGVEYFIRVFAILKNKKSIPVSARVATYLPA
PEGLKFKSVRETSVQVEWDPLNFSFDGWELVFRNMKKDDNGDITSSLKRPETSYMQPGLA
PGQQYNVSLHIVKNNTRGPGLSRVITTKLDAPGQIEAKDVTDTTALITWSKPLAEIEGIELTY
GPKDIPGDRTTIDLSEDENQYSIGNLRPHTEYEVTLISRRGDMESDPMKEVFVTDLDAPRNL
KRVSQTDNSITLEWKNSHANIDNYRIKFAPISGGDHAEITVPKGNQATTRTTLTGLRPGTEYG
IGVTAVRQDRESAPATINAGTDLDNPKDLEVSDPTETTLSLRWRRPVAKFDRYRLIYVHPSG
EKNEMEIPVDSTSFILRGLEAGAEYTISLVAEKGRHKSKPTTVKGLTGVHPEVGELTVSDITP
ESFNLSWTTTNGDFDVFTIEIIDSNRLLEPMEFNISGNSRTAHISGLSPSTDFIVYLYGISHGFR
TQAISAAAKTVVGSPKGISFSDITENSATVSWTPPRTRVDNYRISYVPVTGGTPNIVTVDGSK
TRTKLMKLVPGVDYSVSIISVKGFEESEPISGTLKTALDSPSGLVVVNITDSEALATWQPAIAA
VDNYVVSYASEDEPEVTQTVSGNTVEYDLKGLRPATEYTLSVHALKDTQKSETLSTQFTTG
LDAPRDLSATEVQSETAVITWRPPRAPVTGYLLIYESIDGSVKEVILNPETTTYNLGELSPSTQ
YTVKLQALSRSLKSKTIQTILTTTGLLYPYPKDCSQALLNGETTSGLYTVYLNGDKAQPLQV
FCDMSEDGGGWIVFLRRQNGKEDFYNNWKTYVAGFGDPQDEFWIGLENLHKITSQGQYEL
RVDLQDKGETAYAVYDRFSVGDAKSRYRLRVDGYSGTAGDSMTYHNGRSFSTYDKDNDS
AITNCALSYKGAFWYKNCHRVNLMGRYGDNSHSQGVNWFHWKGHEYSIQFAEMKLRPSS
FRNLEGRRKRA ",
        " organism ": 119
      }
  ]
}
```


2. `/api/proteins/protein_id/` endpoint

- Example ` http://127.0.0.1:8000/api/proteins/A0A016S8J7/ ` Http GET request
- Response


```json
{
  "id": 2,
  "length_of_sequence": 101,
  "protein_id": "A0A016S8J7",
  "sequence":
"MVIGVGFLLVLFSSSVLGILNAGVQLRIEELFDTPGHTNNWAVLVCTSRFWFNYRHVSNVL
ALYHTVKRLGIPDSNIILMLAEDVPCNPRNPRPEAAVLSA",
  "organism": {
    "id": 2,
    "scientific_name": "Ancylostoma ceylanicum",
    "clade": "E",
    "taxonomy": {
      "id": 2,
      "name": null,
      "tax_id": "53326"
    }
  },
  "domains": [
    {
```

```
        "id": 2,
        "protein": 2,
        "protein_family": {
          "id": 2,
          "pf_id": "PF01650",
          "description": "Peptidase C13 legumain"
        },
        "start_coordinate": 40,
        "stop_coordinate": 94
      },
      {
        "id": 3,
        "protein": 2,
        "protein_family": {
          "id": 3,
          "pf_id": "PF02931",
          "description": "Neurotransmitter-gated ion-channel ligand-binding domain"
        },
        "start_coordinate": 23,
        "stop_coordinate": 39
      }
    ]
}
```


3. `/api/taxonomies/` endpoint

- Example ` http://127.0.0.1:8000/api/taxonomies/ ` Http GET request
- Response


```json
{
    "next": " http://127.0.0.1:8000/api/taxonomies/?page=2 ",
    "previous": null,
    "count": 1995,
    "total_pages": 200,
    "current_page": 1,
    "results": [
        {
          "id": 1720,
          "name": null,
          "tax_id": "10007"
        },
        {
          "id": 38,
          "name": null,
          "tax_id": "10029"
        },
        {
          "id": 1040,
          "name": null,
          "tax_id": "1003209"
        },
        {
```

```
        "id": 1321,
        "name": null,
        "tax_id": "100479"
      },
      {
        "id": 1486,
        "name": null,
        "tax_id": "100521"
      },
      {
        "id": 1406,
        "name": null,
        "tax_id": "1007391"
      },
      {
        "id": 345,
        "name": null,
        "tax_id": "100787"
      },
      {
        "id": 768,
        "name": null,
        "tax_id": "100816"
      },
      {
        "id": 656,
        "name": null,
        "tax_id": "10090"
      },
      {
        "id": 1392,
        "name": null,
        "tax_id": "1009499"
      }
  ]
}
```


- To make an HTTP Post request
- with request body (payload)


```json
{
  "name": "the name of taxonomy",
  "tax_id": "1234"
}
```


- Response with HTTP 201 status code


```json
{
  "name": "the name of taxonomy",
  "tax_id": "1234"
}
```

4. `/api/taxonomies/tax_id/` endpoint
- Example ` http://127.0.0.1:8000/api/taxonomies/55661/ ` Http GET request
- Response
```json
{
   "id": 119,
   "name": null,
   "tax_id": "55661"
}
```
5. `/api/organisms/` endpoint
- Example ` http://127.0.0.1:8000/api/organisms/ ` Http GET request
- Response
```json
{
   "next": " http://127.0.0.1:8000/api/organisms/?page=2 ",
   "previous": null,
   "count": 1995,
   "total_pages": 200,
   "current_page": 1,
   "results": [
      {
         "id": 1018,
         "scientific_name": "Abies mariesii",
         "clade": "E",
         "taxonomy": 1018
      },
      {
         "id": 741,
         "scientific_name": "Absidia glauca",
         "clade": "E",
         "taxonomy": 741
      },
      {
         "id": 960,
         "scientific_name": "Acacia ampliata",
         "clade": "E",
         "taxonomy": 960
      },
      {
         "id": 961,
         "scientific_name": "Acacia hemiteles",
         "clade": "E",
         "taxonomy": 961
      },
      {
         "id": 126,
         "scientific_name": "Acanthisitta chloris",
         "clade": "E",
         "taxonomy": 126
      },
      {
```

```
            "id": 1961,
            "scientific_name": "Acanthogobius hasta",
            "clade": "E",
            "taxonomy": 1961
        },
        {
            "id": 1283,
            "scientific_name": "Acer campestre",
            "clade": "E",
            "taxonomy": 1283
        },
        {
            "id": 1289,
            "scientific_name": "Achaea sp. lienardiDHJ02",
            "clade": "E",
            "taxonomy": 1289
        },
        {
            "id": 1290,
            "scientific_name": "Achaeta affinis",
            "clade": "E",
            "taxonomy": 1290
        },
        {
            "id": 860,
            "scientific_name": "Achroiostachys humicola",
            "clade": "E",
            "taxonomy": 860
        }
    ]
}
```


- Example ` http://127.0.0.1:8000/api/organisms/ ` Http POST request
- with request body(payload)


```json
{
    "scientific_name": "My organism name",
    "clade": "E",
    "taxonomy": 1
}
```


- In request body(payload) we give taxonomy pk(id) to make a relationship with organism and taxonomy model(table).
- Response with Http 201 status code


```json
{
    "scientific_name": "My organism name",
    "clade": "E",
    "taxonomy": 1
}
```


6. `/api/organisms/pk/` endpoint

- Example ` http://127.0.0.1:8000/api/organisms/2 ` Http GET request
  - Notice we make request with organşsm primary key
- Response
```json
{
  "id": 2,
  "scientific_name": "Ancylostoma ceylanicum",
  "clade": "E",
  "taxonomy": 2
}
```

7. `/api/protein-families/` endpoint

- Example ` http://127.0.0.1:8000/api/protein-families/ ` Http GET request
- Response
```json
{
  "next": " http://127.0.0.1:8000/api/protein-families/?page=2 ",
  "previous": null,
  "count": 2453,
  "total_pages": 246,
  "current_page": 1,
  "results": [
    {
      "id": 44,
      "pf_id": "CoiledCoil",
      "description": "Kinesin family member 1B isoform CRA_b OS=Homo sapiens GN=KIF1B PE=3 SV=1"
    },
    {
      "id": 61,
      "pf_id": "LowComplexity",
      "description": "TAF5-like RNA polymerase II p300/CBP-associated factor-associated factor 65 kDa subunit 5L (Fragment) OS=Bactrocera dorsalis GN=TAF5L PE=4 SV=1"
    },
    {
      "id": 343,
      "pf_id": "PF00001",
      "description": "G protein-coupled receptor rhodopsin-like"
    },
    {
      "id": 1200,
      "pf_id": "PF00002",
      "description": "GPCR family 2 secretin-like"
    },
    {
      "id": 1042,
      "pf_id": "PF00003",
      "description": "GPCR family 3 C-terminal"
    },
    {
      "id": 222,
      "pf_id": "PF00004",
```

```
      "description": "ATPase AAA-type core"
    },
    {
      "id": 137,
      "pf_id": "PF00005",
      "description": "ABC transporter-like"
    },
    {
      "id": 899,
      "pf_id": "PF00006",
      "description": "ATPase F1/V1/A1 complex alpha/beta subunit nucleotide-binding domain"
    },
    {
      "id": 1901,
      "pf_id": "PF00007",
      "description": "Glycoprotein hormone subunit beta cystine knot"
    },
    {
      "id": 516,
      "pf_id": "PF00008",
      "description": "EGF-like domain"
    }
  ]
}
```


- Example ` http://127.0.0.1:8000/api/protein-families/ ` Http POST request
- with request body(payload)


```json
{
  "pf_id": "PF9999",
  "description": "My description"
}
```


- Response with Http 201 status code


```json
{
  "pf_id": "PF9999",
  "description": "My description"
}
```


8. `/api/protein-families/pk/` endpoint

- Example ` http://127.0.0.1:8000/api/protein-families/PF00360/ ` Http GET request
- Response


```json
{
  "id": 2451,
  "pf_id": "PF00360",
  "description": "Phytochrome central region"
}
```


9. `/api/domains/` endpoint

- Example ` http://127.0.0.1:8000/api/domains/ ` Http GET request
- Response

```json
{
   "next": " http://127.0.0.1:8000/api/domains/?page=2 ",
   "previous": null,
   "count": 10000,
   "total_pages": 1000,
   "current_page": 1,
   "results": [
      {
         "id": 1,
         "protein": 1,
         "protein_family": 1,
         "start_coordinate": 157,
         "stop_coordinate": 314
      },
      {
         "id": 2,
         "protein": 2,
         "protein_family": 2,
         "start_coordinate": 40,
         "stop_coordinate": 94
      },
      {
         "id": 3,
         "protein": 2,
         "protein_family": 3,
         "start_coordinate": 23,
         "stop_coordinate": 39
      },
      {
         "id": 4,
         "protein": 3,
         "protein_family": 4,
         "start_coordinate": 10,
         "stop_coordinate": 99
      },
      {
         "id": 5,
         "protein": 4,
         "protein_family": 5,
         "start_coordinate": 1,
         "stop_coordinate": 33
      },
      {
         "id": 6,
         "protein": 5,
         "protein_family": 5,
         "start_coordinate": 516,
         "stop_coordinate": 551
      },
```

```
        {
            "id": 7,
            "protein": 6,
            "protein_family": 5,
            "start_coordinate": 903,
            "stop_coordinate": 938
        },
        {
            "id": 8,
            "protein": 7,
            "protein_family": 5,
            "start_coordinate": 106,
            "stop_coordinate": 159
        },
        {
            "id": 9,
            "protein": 8,
            "protein_family": 5,
            "start_coordinate": 102,
            "stop_coordinate": 121
        },
        {
            "id": 10,
            "protein": 9,
            "protein_family": 6,
            "start_coordinate": 1634,
            "stop_coordinate": 1642
        }
    ]
}
```


- Example ` http://127.0.0.1:8000/api/domains/ ` Http POST request
- with request body(payload)

```json
{
    "protein": 1234,
    "protein_family": 4567,
    "start_coordinate": 20,
    "stop_coordinate": 89
}
```

- In request body(payload) we give protein pk(id) and protein family pk(id) to make a relationship with protein and protein family model(table).
- Response with Http 201 status code

```json
{
    "protein": 1234,
    "protein_family": 4567,
    "start_coordinate": 20,
    "stop_coordinate": 89
}
```

```
#### Filtering domains by TAXID
- Example ` http://127.0.0.1:8000/api/domains/?taxid=568076 ` GET request
- Response
```json
{
   "next": null,
   "previous": null,
   "count": 7,
   "total_pages": 1,
   "current_page": 1,
   "results": [
      {
         "id": 1,
         "protein": 1,
         "protein_family": 1,
         "start_coordinate": 157,
         "stop_coordinate": 314
      },
      {
         "id": 1181,
         "protein": 1180,
         "protein_family": 571,
         "start_coordinate": 2,
         "stop_coordinate": 226
      },
      {
         "id": 1182,
         "protein": 1181,
         "protein_family": 478,
         "start_coordinate": 21,
         "stop_coordinate": 50
      },
      {
         "id": 1183,
         "protein": 1182,
         "protein_family": 5,
         "start_coordinate": 741,
         "stop_coordinate": 809
      },
      {
         "id": 1184,
         "protein": 1183,
         "protein_family": 172,
         "start_coordinate": 731,
         "stop_coordinate": 848
      },
      {
         "id": 1185,
         "protein": 1184,
         "protein_family": 5,
```
```

```
            "start_coordinate": 17,
            "stop_coordinate": 222
        },
        {
            "id": 1186,
            "protein": 1185,
            "protein_family": 5,
            "start_coordinate": 431,
            "stop_coordinate": 466
        }
    ]
}
```


10. `/api/domains/pk/` endpoint

- Example ` http://127.0.0.1:8000/api/domains/123 ` Http GET request
- Response


```json
{
    "id": 123,
    "protein": 122,
    "protein_family": {
        "id": 5,
        "pf_id": "mobidb-lite",
        "description": "disorder_prediction"
    },
    "start_coordinate": 1,
    "stop_coordinate": 25
}
```


11. `/api/coverage/protein_id` endpoint

- Example ` http://127.0.0.1:8000/api/coverage/A0A016S8J7/ ` Http GET request
- Response


```json
{
    "coverage": 0.693069306930693
}
```