Introduction to MongoDB

26/03/2018

What is MongoDB

- It’s a free NoSQL document oriented database.
  - Not only SQL, since SQL queries are supported.
- It uses JSON-like documents to save data.
  - Flexible schemas - Allows missing fields.
- High performance, high availability, and automatic scaling.
  - Used by large companies like Amazon.

Installation

MongoDB community server

Atlas | Community Server | Enterprise Server

Current Stable Release (3.4.9)

09/11/2017: Release Notes | Changelog
Download Source: tgz | zip

Windows

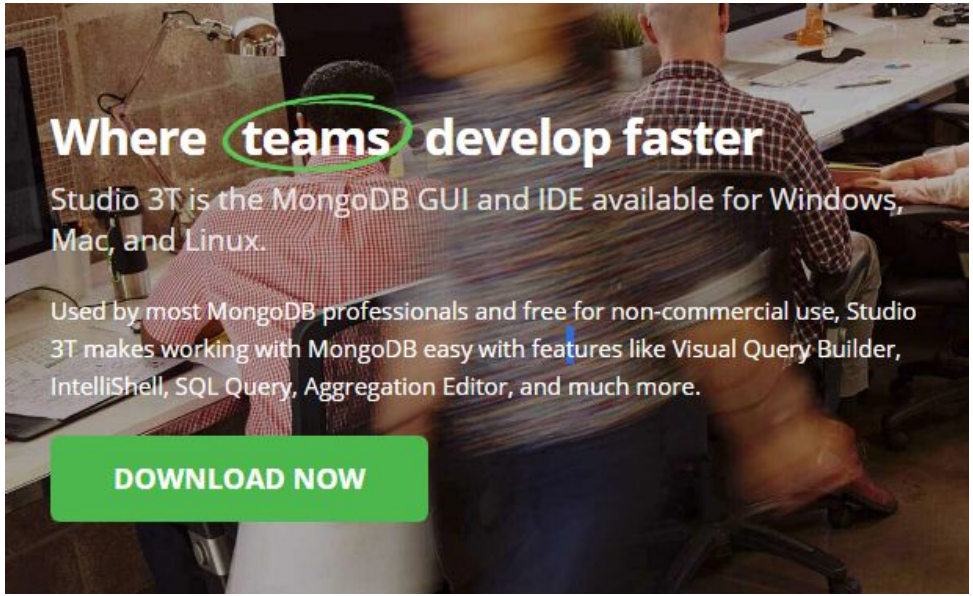
Version:

Windows Server 2008 R2 64-bit and later, with SSL support x64

Installation Package:

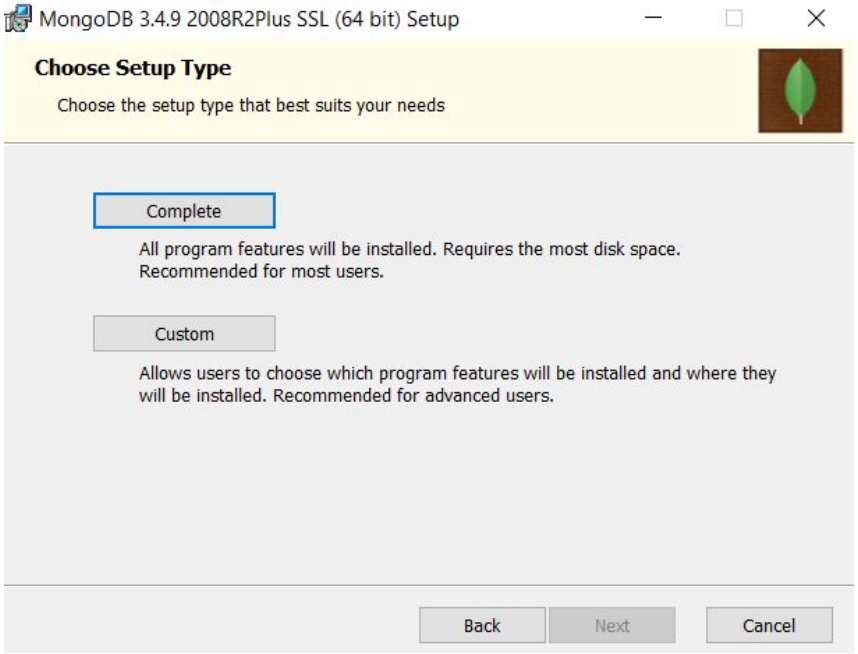
DOWNLOAD (msi)

Studio 3T

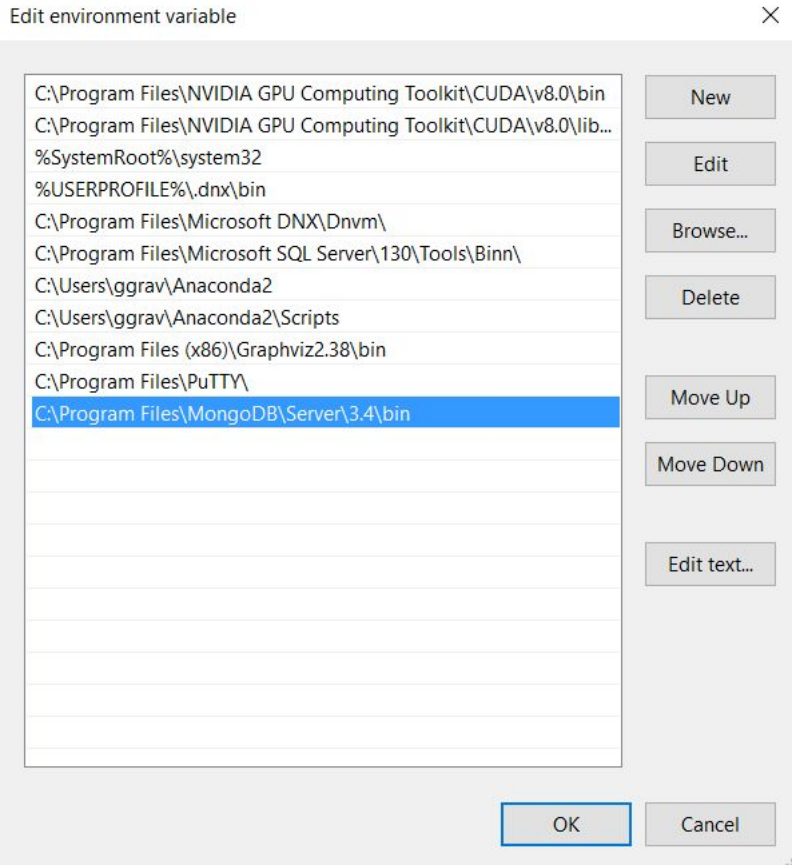


Installation

Step 1



Step 2



Execution

Step 3 -> Create folder “C:\data\db\” -> Open cmd -> run “mongod”

Command Prompt - mongod

```
(c) 2017 Microsoft Corporation. All rights reserved.

C:\Users\ggrav>mongod
2017-10-13T03:50:03.878-0700 I CONTROL  [initandlisten] MongoDB starting : pid=17672 port=27017 dbpath=C:\data\db\ 64-bit host=
2017-10-13T03:50:03.878-0700 I CONTROL  [initandlisten] targetMinOS: Windows 7/Windows Server 2008 R2
2017-10-13T03:50:03.880-0700 I CONTROL  [initandlisten] db version v3.4.9
2017-10-13T03:50:03.880-0700 I CONTROL  [initandlisten] git version: 876ebee8c7dd0e2d992f36a848ff4dc50ee6603e
2017-10-13T03:50:03.880-0700 I CONTROL  [initandlisten] OpenSSL version: OpenSSL 1.0.1u-fips  22 Sep 2016
2017-10-13T03:50:03.880-0700 I CONTROL  [initandlisten] allocator: tcmalloc
2017-10-13T03:50:03.880-0700 I CONTROL  [initandlisten] modules: none
2017-10-13T03:50:03.880-0700 I CONTROL  [initandlisten] build environment:
2017-10-13T03:50:03.880-0700 I CONTROL  [initandlisten]     distmod: 2008plus-ssl
2017-10-13T03:50:03.880-0700 I CONTROL  [initandlisten]     distarch: x86_64
2017-10-13T03:50:03.880-0700 I CONTROL  [initandlisten]     target_arch: x86_64
2017-10-13T03:50:03.880-0700 I CONTROL  [initandlisten] options: {}
2017-10-13T03:50:03.882-0700 I -        [initandlisten] Detected data files in C:\data\db\ created by the 'wiredTiger' storage
the active storage engine to 'wiredTiger'.
2017-10-13T03:50:03.882-0700 I STORAGE  [initandlisten] wiredtiger_open config: create,cache_size=7611M,session_max=20000,evict
threads_max=4),config_base=false,statistics=(fast),log=(enabled=true,archive=true,path=journal,compressor=snappy),file_manager=
0000),checkpoint=(wait=60,log_size=2GB),statistics_log=(wait=0),
2017-10-13T03:50:04.217-0700 I CONTROL  [initandlisten]
2017-10-13T03:50:04.217-0700 I CONTROL  [initandlisten] ** WARNING: Access control is not enabled for the database.
2017-10-13T03:50:04.218-0700 I CONTROL  [initandlisten] **          Read and write access to data and configuration is unrestri
2017-10-13T03:50:04.218-0700 I CONTROL  [initandlisten]
2017-10-13T13:50:04.469+0300 I FTDC     [initandlisten] Initializing full-time diagnostic data capture with directory 'C:/data/

2017-10-13T13:50:04.472+0300 I NETWORK  [thread1] waiting for connections on port 27017
```

What is a document

- A sum of key / value pairs

```
{
  name: "sue",                    ← field: value
  age: 26,                        ← field: value
  status: "A",                    ← field: value
  groups: [ "news", "sports" ]    ← field: value
}
```

What is a collection

- A grouping of MongoDB **documents**.
- A **collection** is the equivalent of an RDBMS table.
- A **collection** exists within a single database.
- **Collections** do not enforce a schema.
- **Documents** within a collection can have different fields.
- **Collections** are grouped into **databases**.

Example: **db** = tweets, **collections** = greek_tweets, english_tweets, etc.

Operations

- Run / Connect to mongo
- Import documents
- Insert documents
- Create queries
- Quick data lookups
- Indexing

https://www.mongodb.com/what-is-mongodb

Connection

Studio 3T:

- Studio 3T -> Connect -> New connection -> (enter name) -> Save -> Connect
- Right click -> Add database -> (enter name) -> ok

Python:

```
import pymongo

client = pymongo.MongoClient('localhost', 27017)
db = client['yelp']
```

Import dataset

Studio 3T:

- Connect -> Select DB -> Import collections -> JSON -> Add sources -> Rename target collections -> Rename collections* -> Start import

* Rename collections to “restaurants”, “reviews” and “users”.

Insert documents

Python:

```
38          # Find the coordinates for each restaurant and
39          # save them to an external collection
40          all_restaurants = find_all_restaurants()
41          for restaurant in all_restaurants:
42              json_obj = {
43                  'name': restaurant['name'],
44                  'business_id': restaurant['business_id'],
45                  'longitude': restaurant['longitude'],
46                  'latitude': restaurant['latitude']
47              }
48              insert_to_db(json_obj, 'restaurants_coordinates')
```

Querying

Studio 3T:

- Right click collection -> Open Intellishell
- Examples:
  - db.restaurants.find({})
  - db.restaurants.find({"neighborhood": "Downtown"})
  - db.restaurants.find({ **$and**: [{"neighborhood": "Southeast"}, {"city": "Las Vegas"}]})

Python:

```
db['restaurants'].find({'neighborhood': neighborhood})
db['restaurants'].find_one({'business_id': restaurant_id})
db['reviews'].find({"$and": [{"business_id": restaurant_id}, {"stars": 5}]})
```

Data lookups - For quick data checking

Studio 3T:

- Right click collection -> Open Intellishell
  - Ex: db.collection_name.find({ "Search_Field": "value" }, { "Field_to_display": 1 })
  - db.restaurants.find({ "neighborhood": "Downtown" }, { "name": 1 })
  - db.restaurants.find({ "name": /.*pollos.*/ }, { "text": 1 })
    - /.* is the regex equivalent for: “any single character, 0 or more times”

Python:

```
27      def find_reviews_that_contain_a_word(word):
28          return db['reviews'].find({'text': {'$regex': '.*' + word + '.*'}})
29
```

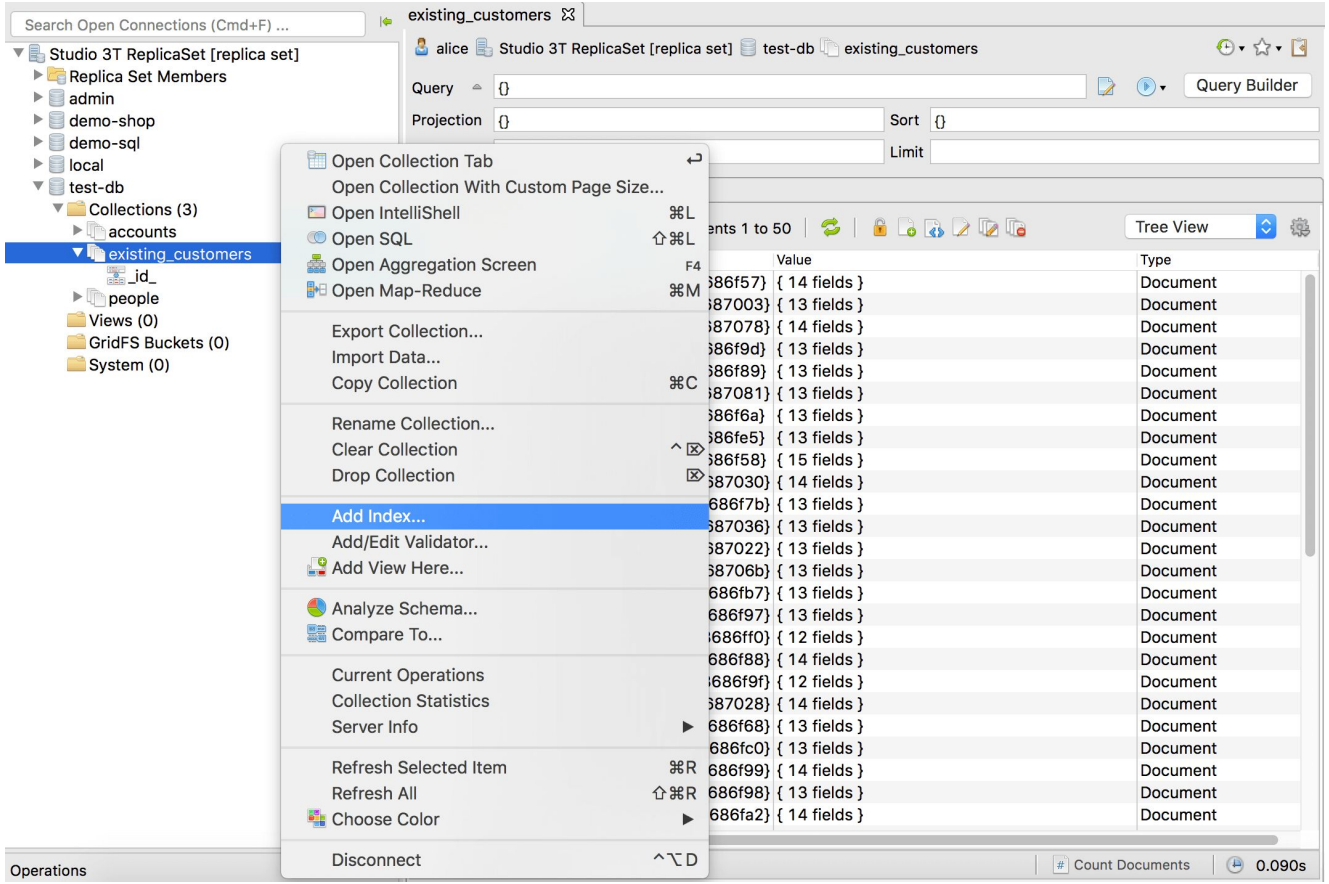
"this lecture isn't mandatory, however it will offer you valuable informa-"

Indexing

- Basic indexing
  - Speeds up queries on specific fields
  - Mostly used fields should be indexed
  - Index responsibly : Too many indices might slow down the database

- Text indexing
  - Faster text search queries on string content
  - Term lookup
  - Exact phrase lookup
  - Automatic relevance sorting

How to - Text indexing



How to - Text indexing

Studio 3T for MongoDB

Connect | Collection | IntelliShell | SQL | Aggregate | Map-Reduce | Export | Import | Users | Roles | Schema | Compare | Feedback

Search Open Connections (Cmd+F)

- Studio 3T ReplicaSet [replica set]
  - Replica Set Members
  - admin
  - demo-shop
  - demo-sql
  - local
  - test-db
    - Collections (3)
      - accounts
      - existing_customers
      - people
    - Views (0)
    - GridFS Buckets (0)
    - System (0)

Operations

Add Index

alice | Studio 3T ReplicaSet (3 servers) | test-db | existing_customers

Name: compound_text_index

Fields | Text Options | Geo Options | Partial Index Options | JSON | Collation

Indexed Fields:

Field	Index Type

Add Field(s)... | Remove Field | Move Up | Move Down

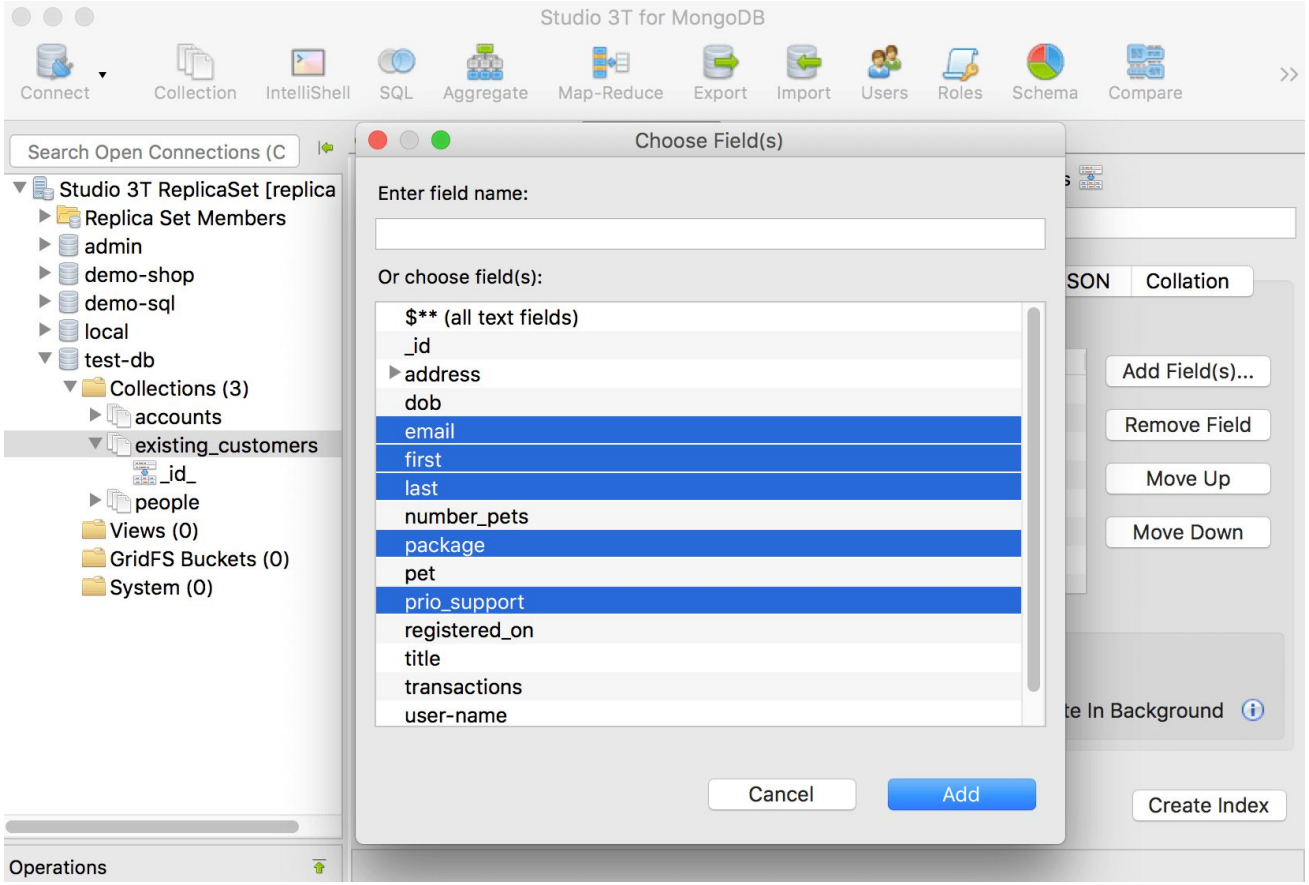
Index Options

Unique | Sparse | Drop Duplicates

Expire After Seconds | Create In Background

Create Index

How to - Text indexing



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Operations

Add Index

alice | Studio 3T ReplicaSet (3 servers) | test-db | existing_customers

Name: compound_text_index

Fields | Text Options | Geo Options | Partial Index Options | JSON | Collation

Indexed Fields:

Field	Index Type
email	text
first	
last	
package	
prio_support	

ascending
descending
hashed
text
2dsphere
2d
geoHaystack

Add Field(s)... | Remove Field | Move Up | Move Down

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Index Options

☐ Unique ☐ Sparse ☐ Drop Duplicates

☐ Expire After Seconds ☑ Create In Background

Create Index

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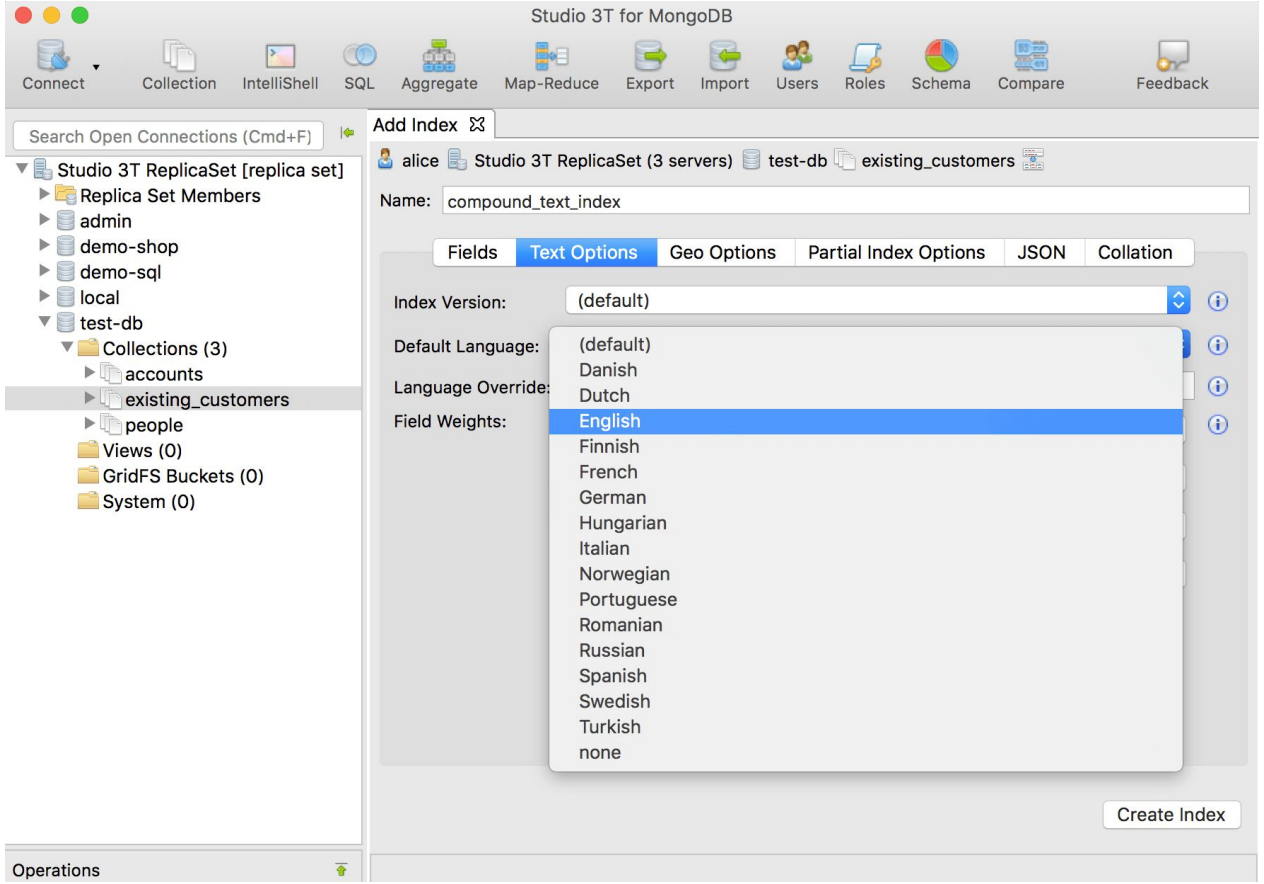
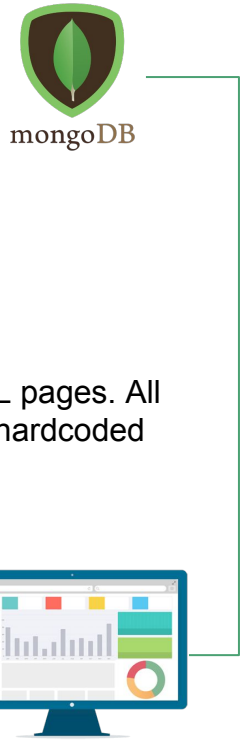


Querying with text indices

- db.stores.find({ $text: { $search: "java coffee shop" } })
  - $text tokenizes the search string and performs a logical OR
  - Will search on all indexed fields
  - Results include a relevance score for each record
- db.stores.find({ $text: { $search: "java \"coffee shop\"" } })
  - Will match exact phrases “java” OR “coffee shop”
- db.stores.find({ $text: { $search: "java shop -coffee" } })
  - Will match (“java” OR “shop”) AND NOT(“coffee”)

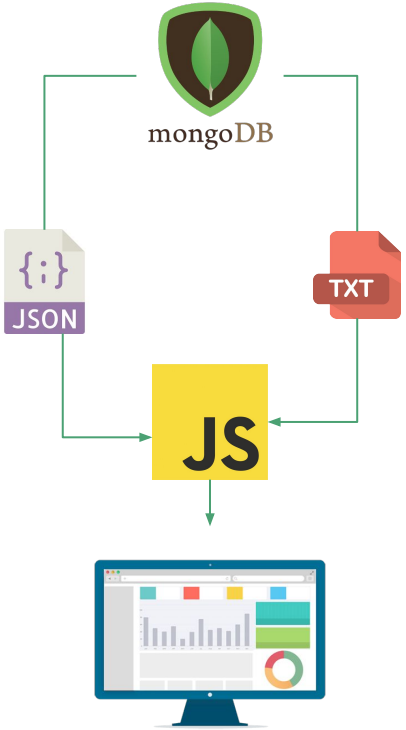
Web app development

Possibility #1

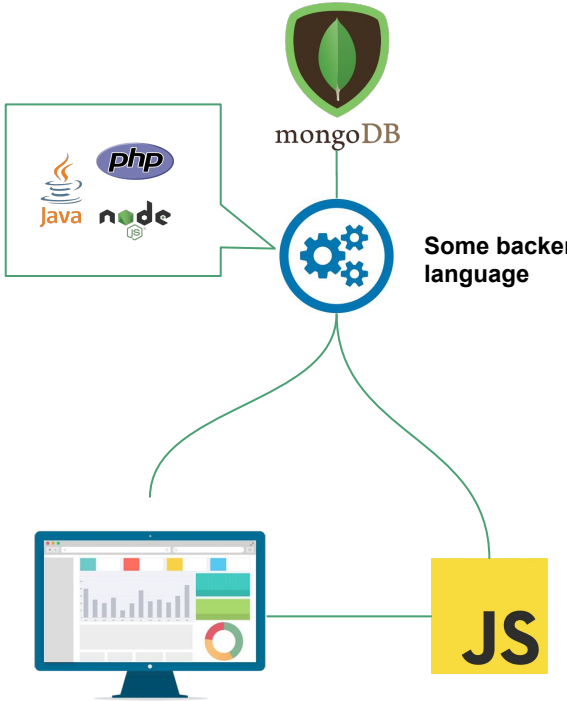


Static HTML pages. All results are hardcoded

Possibility #2



Possibility #3



A python-based microframework, suitable for small-scale applications.

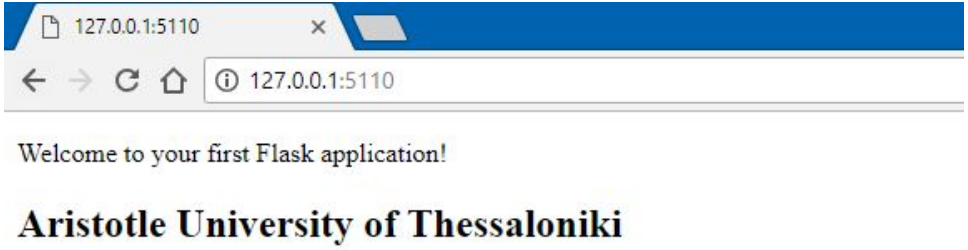
How to create a simple Flask App:

app.py

```python
from flask import Flask, render_template

app = Flask(__name__, template_folder='views')

@app.route("/")
def home():
    uni_name = "Aristotle University of Thessaloniki"
    return render_template('some_html_file.html', uni_name=uni_name)

if __name__ == "__main__":
    app.run(debug=True, host='127.0.0.1', port=5110)
```

some_html_file.html

```html
<!doctype html>
<html>
    <head>
        <meta charset="utf-8">
    </head>
    <body>
        <p>Welcome to your first Flask application!</p>
        <!-- Variable is passed, using the jinja2 templating engine -->
        <h2>{{ uni_name }}</h2>
    </body>
</html>
```



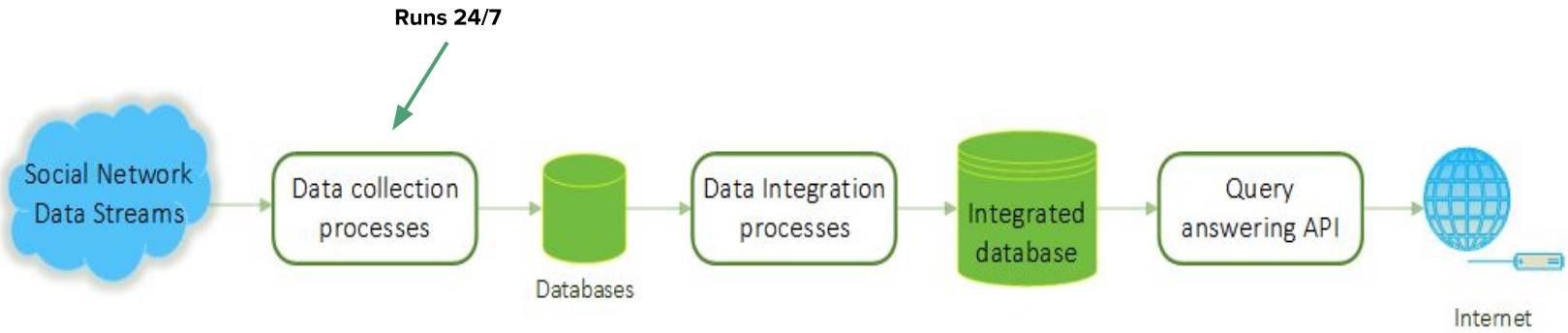
Diligent - A Social Media Data Integration platform

- Social media data explosion - Information Era
  - All data and metadata are saved into databases
  - Including private information (fingerprint, face, political views, etc.)

- Various data sources can be Integrated
  - Extract valuable insights
  - Personalized advertising
  - Sentiment analysis
  - -> Build a complete image - Increase data value $$

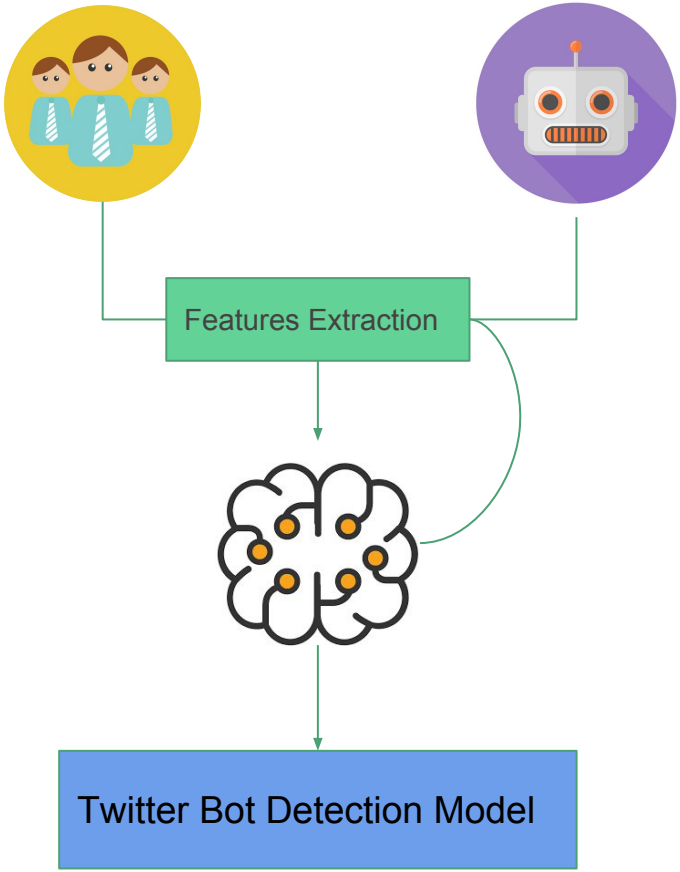
- Machine Learning opportunities
  - Integrated data as input

Diligent - System pipeline

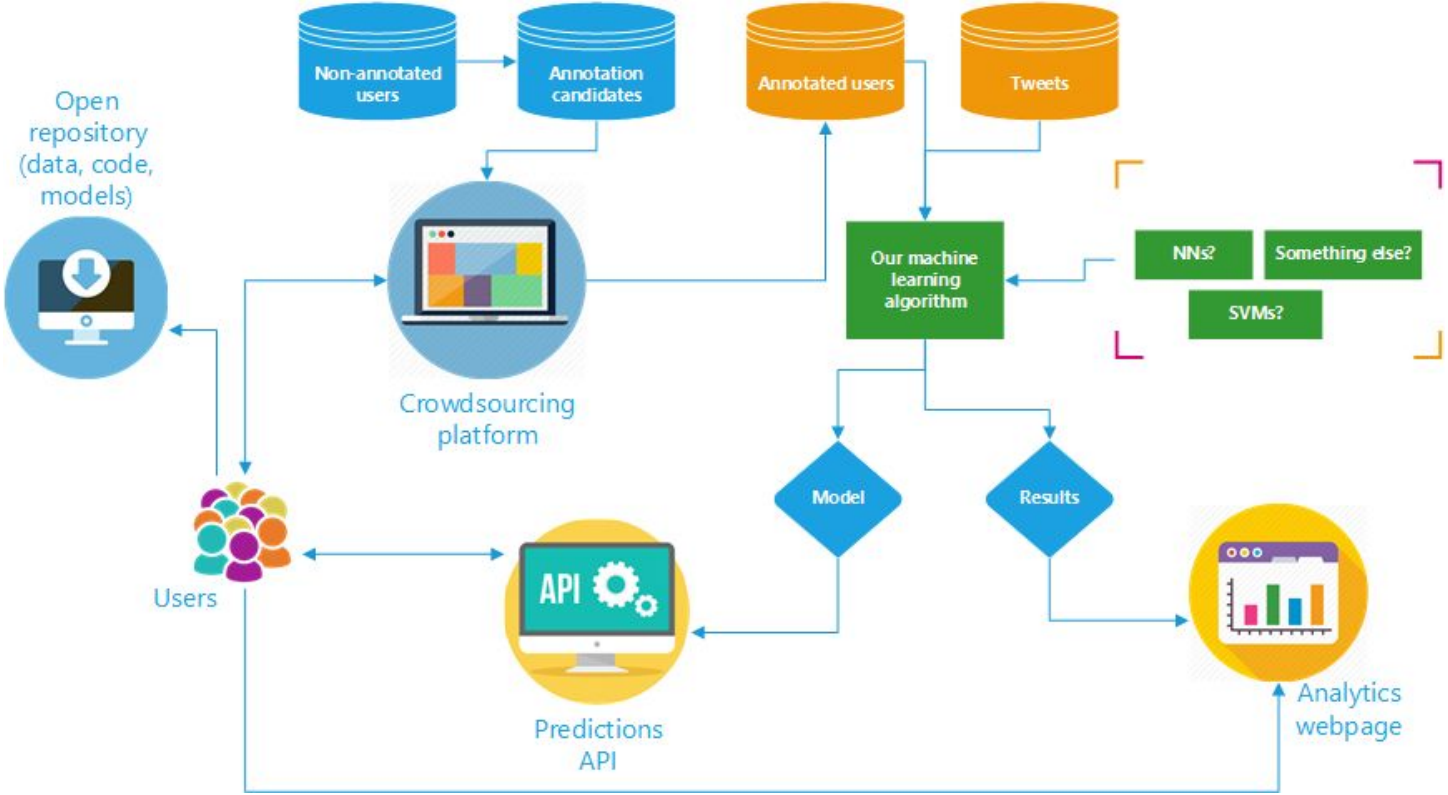


Twitter bots detection

- Own a set of pre-annotated users as bots or humans
- Extract features from each user (focus on sentiment)
  - E.g. “num of tweets”, “tweets entropy”, “average sentiment polarity”
- Feed a machine learning algorithm all the features vectors
- Evaluate and extract model



Full-scale architecture



Resources

- Dataset jsons
- Github link
- MongoDB
- Flask
- Flask-RESTful
- Python