

Project Title:

Empowerment Hub: A Flask-Based Motivational Web Application Featuring DevOps Practices.

Project Objective:

To develop, containerize, and deploy a Flask-based web app with a focus on implementing **DevOps methodologies**, including:

- Version control
- Docker-based containerization
- Infrastructure as Code (IaC) via Terraform
- Kubernetes deployment
- CI/CD pipelines using jenkins
- Cloud observability and monitoring

Technologies used:-

Component	Tools / Frameworks
Web Framework	Flask (Python)
UI/Styling	HTML5, CSS3, JavaScript
Containerization	Docker
container registry	Docker hub
Orchestration	Kubernetes (Minikube)
CI/CD	Jenkins
Cloud Platform	AWS EC2, CloudWatch
IaC	Terraform
Monitoring Tools	CloudWatch
Version control system & IDE	Git, GitHub, VS Code

Application Structure

Pages:

- Home: Landing page with motivational messaging.
- About: Overview of the application's purpose.
- Quotes: Inspirational quotes collection.
- Blog: Articles on growth and self-development.
- Contact: Form for user interaction- feedback or suggestions.

Github url : <https://github.com/jyotiraul/sparknet-motivation-web-app.git>

Phase 1 : Application Setup and cloud Deployment.

1. Local Environment Setup

```
PS C:\assignment\Sparknet-Innovation\motivation-web-app> python --version
Python 3.13.3
PS C:\assignment\Sparknet-Innovation\motivation-web-app> Flask --version
Python 3.13.3
Flask 2.2.2
Werkzeug 2.2.3
PS C:\assignment\Sparknet-Innovation\motivation-web-app> git --version
git version 2.47.0.windows.1
PS C:\assignment\Sparknet-Innovation\motivation-web-app> Docker --version
Docker version 24.0.2, build cb74dfc
PS C:\assignment\Sparknet-Innovation\motivation-web-app> Aws --version
aws-cli/2.23.2 Python/3.12.6 Windows/10 exe/AMD64
PS C:\assignment\Sparknet-Innovation\motivation-web-app> Terraform --version
Terraform v1.11.0
on windows_386
```

1.Clone the Repository

git clone <https://github.com/sparknet-innovations/motivation-web-app.git>

cd motivation-web-app

2.Create a Virtual Environment

python -m venv venv

3. Activate the Virtual Environment

venv\Scripts\activate

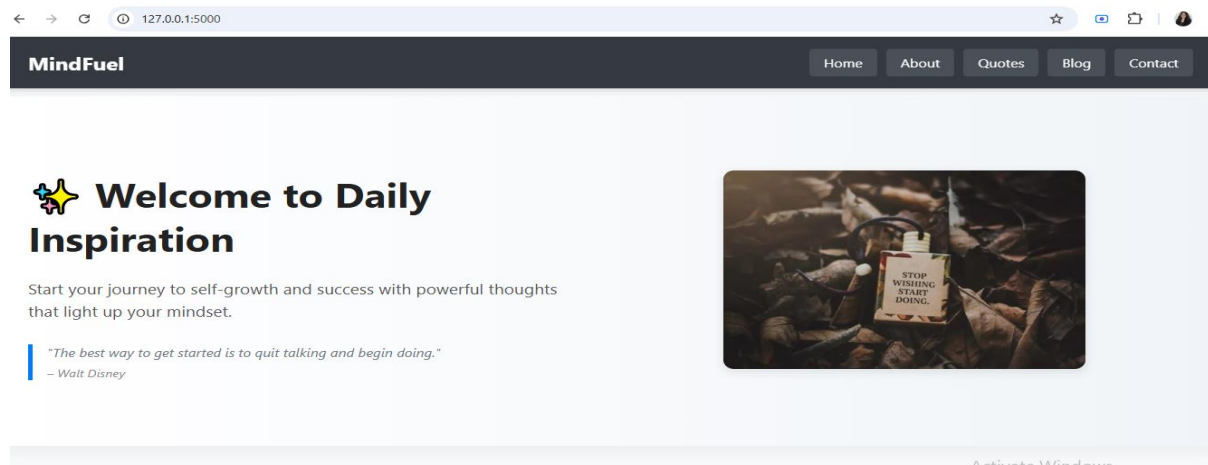
4.Install Dependencies

pip install -r requirements.txt

5.Run the Application

python run.py

6. Access the Application Open your web browser and go to <http://127.0.0.1:5000>



2. Create a New Git Repository on GitHub and Push Your Code

- Go to [GitHub](https://github.com) and create a new repository.
- Copy the repository URL (e.g., <https://github.com/your-username/your-repo.git>).
- In your local project directory, run the following commands:

```
git init
```

```
git add .
```

```
git commit -m "Initial commit"
```

```
git remote add origin <your-repo-url>
```

```
git push -u origin main
```

2. Dockerization of the Flask Application

- Docker Desktop is up and running on your laptop.
- Create a Dockerfile

This Dockerfile builds a lightweight container image for a Python web application running with Gunicorn on port 5000.

```
motivation-web-app > Dockerfile > ...
1  # Use an official Python runtime as a parent image
2  FROM python:3.10-slim
3
4  # Set environment variables
5  ENV PYTHONDONTWRITEBYTECODE=1 \
6      PYTHONUNBUFFERED=1
7
8  # Set work directory
9  WORKDIR /app
10
11 # Copy requirements and install
12 COPY requirements.txt /app/
13 RUN pip install --upgrade pip \
14     && pip install -r requirements.txt
15
16 # Copy the whole project
17 COPY . /app/
18
19 # Expose the port Gunicorn will run on
20 EXPOSE 5000
21
22 # Command to run the application using Gunicorn
23 CMD ["gunicorn", "-b", "0.0.0.0:5000", "run:app"]
```

Explanation of Dockerfile:

1. Base Image FROM python:3.10-slim

- Uses the official Python 3.10 slim image as the base.
- The slim variant keeps the image small by excluding unnecessary tools.

2. Environment Variables

PYTHONDONTWRITEBYTECODE=1

Prevents Python from writing .pyc files, reducing unnecessary files in the container.

PYTHONUNBUFFERED=1

Ensures Python output is sent straight to the terminal without buffering, useful for real-time logging.

3. Working Directory `WORKDIR /app`

Sets /app as the working directory inside the container.

All subsequent commands run relative to this directory.

4. Copy and Install Dependencies

`COPY requirements.txt /app/` → Copies the requirements.txt file to /app.

`RUN pip install --upgrade pip \` → -Upgrades pip to the latest version.

`&& pip install -r requirements.txt` → Installs all Python dependencies listed in requirements.txt

5. Copy Application Code

`COPY . /app/` → Copies the entire project directory into /app inside the container.

6. Expose Port `EXPOSE 5000`

Declares that the container listens on port 5000.

This is the port Gunicorn will bind to and serve the app on.

7. Run the Application

Gunicorn (Green Unicorn) is a Python Web Server Gateway Interface (WSGI) HTTP server for running Python web applications). Gunicorn is a production-ready server that can serve Python web apps efficiently. Gunicorn is designed to handle multiple concurrent requests and is more stable.

`CMD ["gunicorn", "-b", "0.0.0.0:5000", "run:app"]`

-Runs the app using Gunicorn WSGI HTTP server.

-Binds Gunicorn to all network interfaces (0.0.0.0) on port 5000.

-Assumes the Flask app instance is called app inside the Python module/file named run.py.

Build Docker image → creates a Docker image for your web application based on the instructions defined in your Dockerfile.

-- docker build -t motivation-web-app .

```
PS C:\assignment\Motivation-web-app\motivation-web-app> docker build -t motivation-web-app .
[+] Building 1.5s (2/3)
[+] Building 1.8s (2/3)
[+] Building 2.0s (2/3)
[+] Building 186.7s (11/11) FINISHED
=> [internal] load build definition from Dockerfile
=> => transferring dockerfile: 576B
=> [internal] load .dockerignore
=> => transferring context: 2B
=> [internal] load metadata for docker.io/library/python:3.10-slim
=> [auth] library/python:pull token for registry-1.docker.io
=> [1/5] FROM docker.io/library/python:3.10-slim@sha256:49454d2bf78a48f217eb25ecbcb4b5face313fea6a6e82706465a6990303ada2
=> => sha256:49454d2bf78a48f217eb25ecbcb4b5face313fea6a6e82706465a6990303ada2 9.13kB / 9.13kB
=> => sha256:ac71103cf5137882806aad2d7ece409bbfe86c075e7478752d36ea073b0934d7 1.75kB / 1.75kB
=> => sha256:e6d8b768c22ff169d0d5b7449ecede9ff35f2cf7f11f401df313e5d57e28c7a4 5.37kB / 5.37kB
=> => sha256:61320b01ae5e0798393ef25f2dc72faf43703e60ba089b07d7170acbabbf8f62 28.23MB / 28.23MB
=> => sha256:f7abc9c3447359394271ff08c7c7b2d1e8a2784e89ab6569c29a52fd3146b1bd 3.51MB / 3.51MB
=> => sha256:40f0d3a623c50c688c5c787d314e472c5c70303113bd300c9f56a0928a09b4 15.65MB / 15.65MB
```

```
PS C:\assignment\Motivation-web-app\motivation-web-app> docker images
```

REPOSITORY	TAG	IMAGE ID	CREATED	SIZE
motivation-web-app	latest	b0dd15df88ee	About a minute ago	145MB

Run the application on -- **docker run -p 5000:5000 motivation-web-app**

→ docker run: Runs a new container from an image.

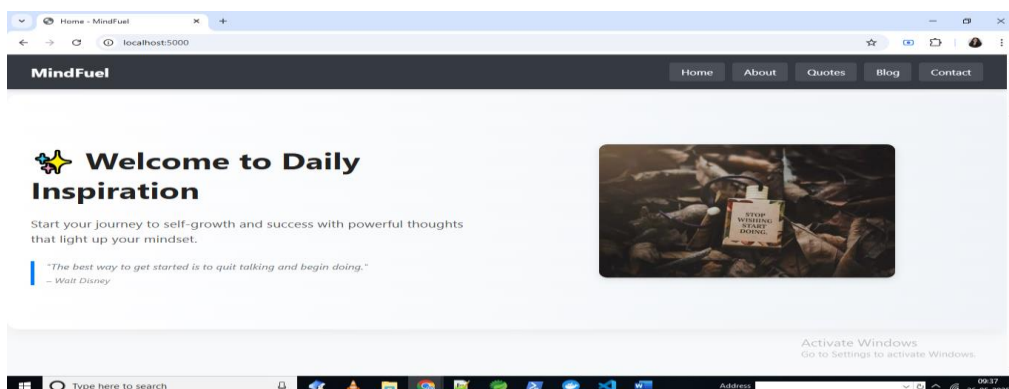
→ -p 5000:5000: Maps port 5000 on your host to port 5000 inside the container.

This allows you to access the web app from your browser at <http://localhost:5000>.

→ motivation-web-app: The name (tag) of the Docker image.

```
PS C:\assignment\Motivation-web-app\motivation-web-app> docker run -p 5000:5000 motivation-web-app
[2025-05-23 06:12:06 +0000] [1] [INFO] Starting gunicorn 20.1.0
[2025-05-23 06:12:06 +0000] [1] [INFO] Listening at: http://0.0.0.0:5000 (1)
[2025-05-23 06:12:06 +0000] [1] [INFO] Using worker: sync
[2025-05-23 06:12:06 +0000] [6] [INFO] Booting worker with pid: 6
[2025-05-23 06:18:30 +0000] [1] [INFO] Handling signal: int
[2025-05-23 06:18:31 +0000] [6] [INFO] Worker exiting (pid: 6)
[2025-05-23 06:18:31 +0000] [1] [INFO] Shutting down: Master
```

Output: localhost:5000



Push image to docker hub-

docker login

docker tag motivation-web-app rauljyoti/motivation-web-app:latest

docker push rauljyoti/motivation-web-app:latest

```

PS C:\assignment\Motivation-web-app\motivation-web-app> docker login
[2025-05-23T06:18:37.884174400Z][docker-credential-desktop][W] Windows version might not be up-to-date: The system cannot find the file specified.
Authenticating with existing credentials...
[2025-05-23T06:18:40.314240500Z][docker-credential-desktop][W] Windows version might not be up-to-date: The system cannot find the file specified.
Login Succeeded
[2025-05-23T06:18:40.544021600Z][docker-credential-desktop][W] Windows version might not be up-to-date: The system cannot find the file specified.

Logging in with your password grants your terminal complete access to your account.
For better security, log in with a limited-privilege personal access token. Learn more at https://docs.docker.com/go/access-tokens/
PS C:\assignment\Motivation-web-app\motivation-web-app> docker tag motivation-web-app rauljyoti/motivation-web-app:latest
PS C:\assignment\Motivation-web-app\motivation-web-app> docker push rauljyoti/motivation-web-app:latest
[2025-05-23T06:20:31.481009000Z][docker-credential-desktop][W] Windows version might not be up-to-date: The system cannot find the file specified.
The push refers to repository [docker.io/rauljyoti/motivation-web-app]
24a33ead510c: Pushed
7412a9fca19d: Pushed
44d55f1060bb: Pushed
a165b0a51340: Pushed

```

```

PS C:\assignment\Motivation-web-app\motivation-web-app> docker images

```

REPOSITORY	TAG	IMAGE ID	CREATED	SIZE
motivation-web-app	latest	a1fe3efb96a4	10 minutes ago	145MB
rauljyoti/motivation-web-app	latest	a1fe3efb96a4	10 minutes ago	145MB

Pull the image from Docker Hub and verify that it's working correctly

Docker pull rauljyoti/motivation-web-app:latest

docker run -d -p 5000:5000 rauljyoti/motivation-web-app:latest

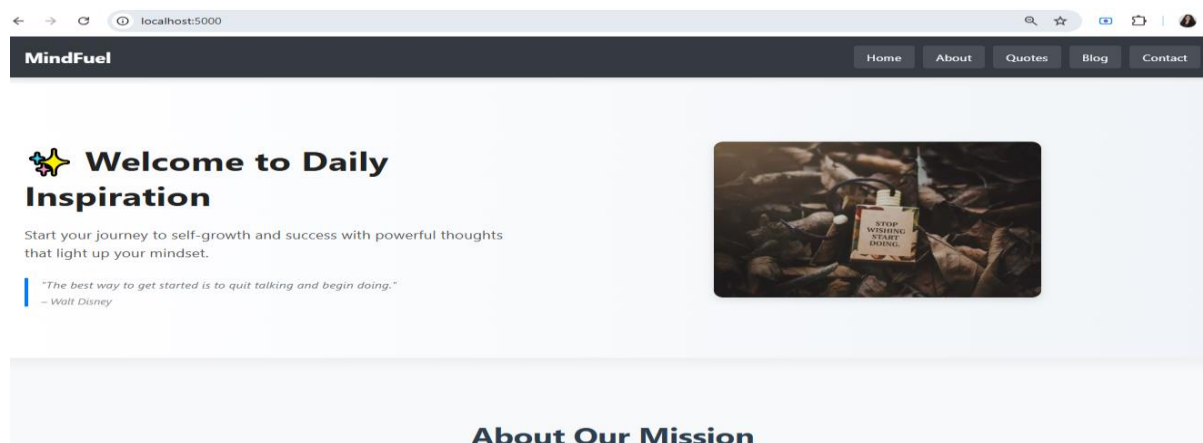
```

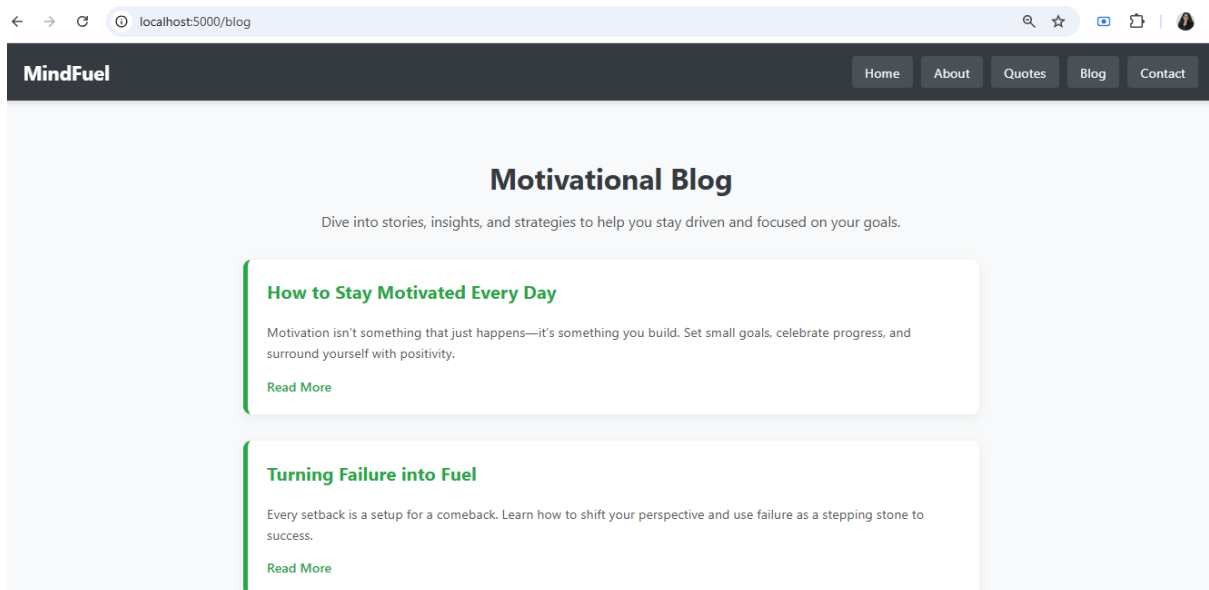
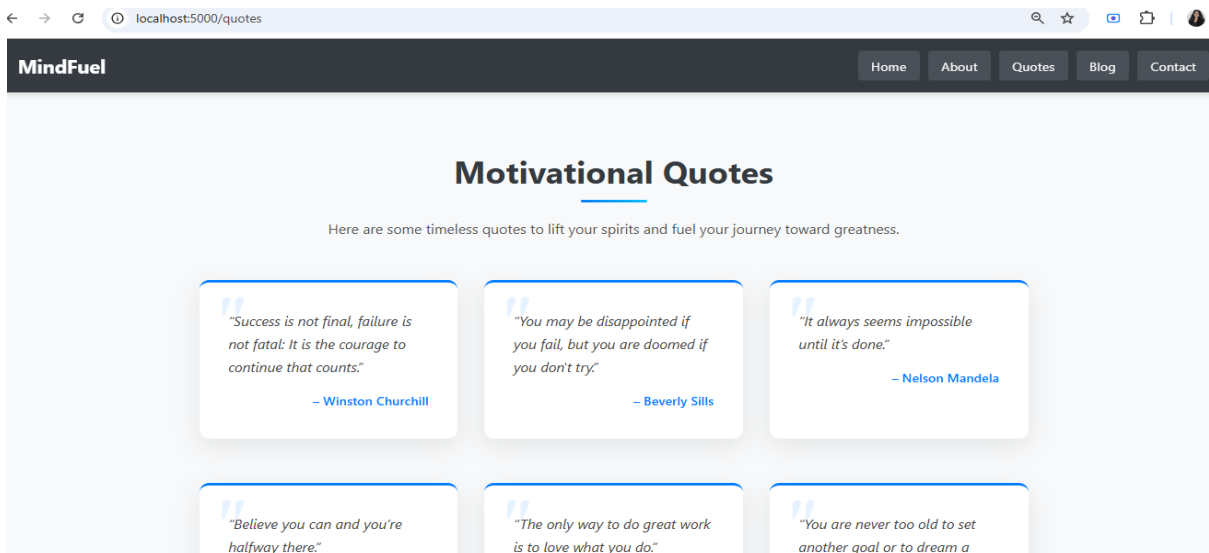
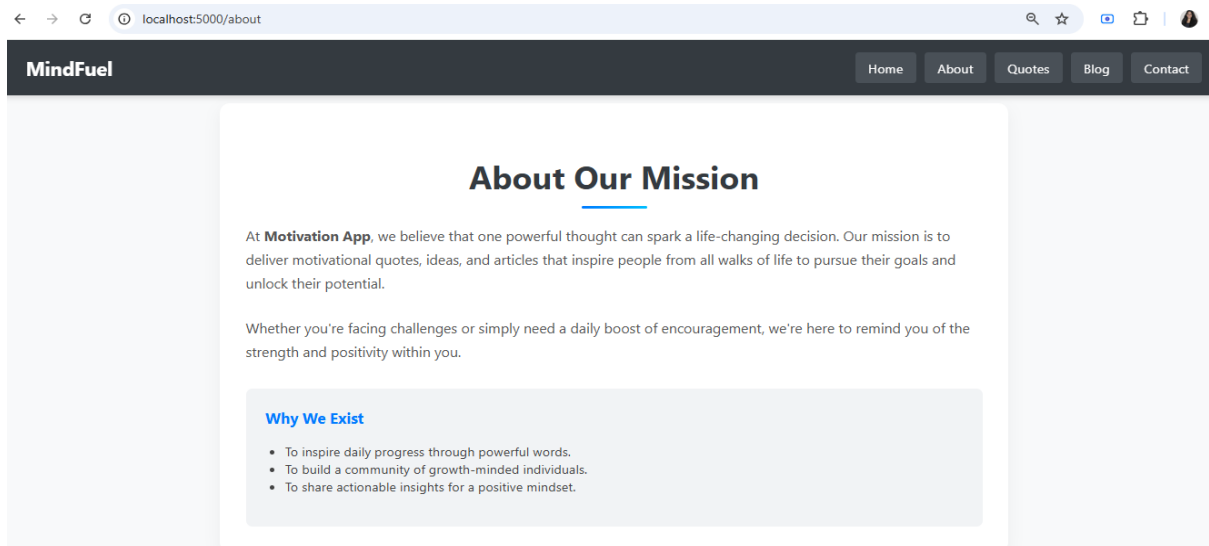
PS C:\assignment\Motivation-web-app\motivation-web-app> docker pull rauljyoti/motivation-web-app:latest
[2025-05-23T06:30:36.261225500Z][docker-credential-desktop][W] Windows version might not be up-to-date: The system cannot find the file specified.
latest: Pulling from rauljyoti/motivation-web-app
Digest: sha256:bb0224b4831cfcfb5ecfe1f3eb853848c3f7445173ec605c6fdff7a8f53a92f4
Status: Image is up to date for rauljyoti/motivation-web-app:latest
docker.io/rauljyoti/motivation-web-app:latest
PS C:\assignment\Motivation-web-app\motivation-web-app> docker run -p 5000:5000 rauljyoti/motivation-web-app:latest
[2025-05-23 06:30:55 +0000] [1] [INFO] Starting gunicorn 20.1.0
[2025-05-23 06:30:55 +0000] [1] [INFO] Listening at: http://0.0.0.0:5000 (1)
[2025-05-23 06:30:55 +0000] [1] [INFO] Using worker: sync
[2025-05-23 06:30:55 +0000] [7] [INFO] Booting worker with pid: 7
[2025-05-23 06:31:23 +0000] [1] [INFO] Handling signal: int
[2025-05-23 06:31:23 +0000] [7] [INFO] Worker exiting (pid: 7)
[2025-05-23 06:31:24 +0000] [1] [INFO] Shutting down: Master
PS C:\assignment\Motivation-web-app\motivation-web-app> ^C
PS C:\assignment\Motivation-web-app\motivation-web-app> docker run -d -p 5000:5000 rauljyoti/motivation-web-app:latest
9f5d3e093bc145240b942da1383d0c45d7b81a5b3b16306ec1e3b55df6818151

```

Application is running on : localhost:5000

Screenshots of each implemented route/pages--





3. Deployment using Kubernetes

Deployment using minikube for local orchestration.

1. deployment.yml - Defines the desired state for a set of Pods running your application. It manages updates, scaling, and ensures the specified number of replicas are always running.

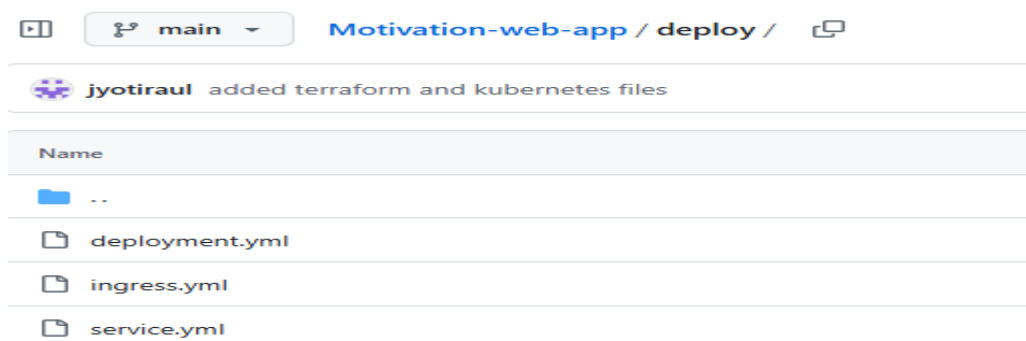
Purpose: Automates the creation and management of application Pods.

2. service.yml - Exposes your deployment internally (ClusterIP) or externally (NodePort/LoadBalancer) so other components or users can access it.

Purpose: Provides stable networking and load balancing for your Pods.

3. ingress.yml - Manages external access to your services, typically via HTTP/HTTPS. It defines routing rules, hostnames, and TLS configurations.

Purpose: Acts as an entry point for external traffic, routing requests to the appropriate services.



Note: Ensure Docker Desktop is running

Install minikube <https://minikube.sigs.k8s.io/docs/start/?arch=%2Fwindows%2Fx86-64%2Fstable%2F.exe+download>

minikube start


```

PS C:\assignment\Motivation-web-app\motivation-web-app> minikube start
minikube v1.35.0 on Microsoft Windows 10 Pro 10.0.17763.805 Build 17763.805
✦ Using the docker driver based on existing profile
✦ Starting "minikube" primary control-plane node in "minikube" cluster
✦ Pulling base image v0.0.46 ...
✦ Updating the running docker "minikube" container ...
! Failing to connect to https://registry.k8s.io/ from inside the minikube container
✦ To pull new external images, you may need to configure a proxy: https://minikube.sigs.k8s.io/docs/reference/networking/proxy
✦ Preparing Kubernetes v1.32.0 on Docker 27.4.1 ...
✦ Verifying Kubernetes components...
  ✦ Using image gcr.io/k8s-minikube/storage-provisioner:v5
✦ Enabled addons: storage-provisioner, default-storageclass

! C:\Program Files\Docker\Docker\resources\bin\kubectl.exe is version 1.25.9, which may have incompatibilities with Kubernetes
  ✦ Want kubectl v1.32.0? Try 'minikube kubectl -- get pods -A'
✦ Done! kubectl is now configured to use "minikube" cluster and "default" namespace by default

```

kubectl apply -f deployment.yml

kubectl apply -f service.yml

kubectl apply -f ingress.yml

minikube service motivation-service

```

PS C:\assignment\Sparknet-Innovation\motivation-web-app\deploy> kubectl apply -f deployment.yml
deployment.apps/motivation-app created
PS C:\assignment\Sparknet-Innovation\motivation-web-app\deploy> kubectl apply -f service.yml
service/motivation-service created
PS C:\assignment\Sparknet-Innovation\motivation-web-app\deploy> kubectl apply -f ingress.yml
ingress.networking.k8s.io/motivation-ingress unchanged
PS C:\assignment\Sparknet-Innovation\motivation-web-app\deploy> kubectl get pod
NAME                                READY STATUS RESTARTS AGE
motivation-app-bbcb5b595-kg2qb      1/1    Running 0       71s
PS C:\assignment\Sparknet-Innovation\motivation-web-app\deploy> kubectl get deployment
NAME          READY UP-TO-DATE AVAILABLE AGE
motivation-app 1/1    1           1       79s
PS C:\assignment\Sparknet-Innovation\motivation-web-app\deploy> kubectl get svc
NAME            TYPE        CLUSTER-IP    EXTERNAL-IP    PORT(S)          AGE
kubernetes      ClusterIP   10.96.0.1     <none>         443/TCP          6d20h
motivation-service LoadBalancer 10.98.64.44    <pending>      80:32398/TCP    84s
PS C:\assignment\Sparknet-Innovation\motivation-web-app\deploy> kubectl get ingress
NAME           CLASS    HOSTS           ADDRESS    PORTS    AGE
motivation-ingress <none>  motivation.local  <none>     80       4d6h

```

```

PS C:\assignment\Sparknet-Innovation\motivation-web-app\deploy> minikube service motivation-service
-----|-----|-----|-----|
| NAMESPACE | NAME          | TARGET PORT | URL                               |
|-----|-----|-----|-----|
| default   | motivation-service | 80          | http://192.168.49.2:32398       |
|-----|-----|-----|-----|
✦ Starting tunnel for service motivation-service.
-----|-----|-----|-----|
| NAMESPACE | NAME          | TARGET PORT | URL                               |
|-----|-----|-----|-----|
| default   | motivation-service | 80          | http://127.0.0.1:61967         |
|-----|-----|-----|-----|
✦ Opening service default/motivation-service in default browser...
! Because you are using a Docker driver on windows, the terminal needs to be open to run it.

```

http://127.0.0.1:61967/

🌟 Welcome to Daily Inspiration

Start your journey to self-growth and success with powerful thoughts that light up your mindset.

"The best way to get started is to quit talking and begin doing."
– Walt Disney



About Our Mission

At **Motivation App**, we believe that one powerful thought can spark a life-changing decision. Our mission is to deliver motivational quotes, ideas, and articles that inspire people from all walks of life to pursue their goals and unlock their potential.

Whether you're facing challenges or simply need a daily boost of encouragement, we're here to remind you of the strength and positivity within you.

Why We Exist

- To inspire daily progress through powerful words.
- To build a community of growth-minded individuals.
- To share actionable insights for a positive mindset.

Motivational Quotes

Here are some timeless quotes to lift your spirits and fuel your journey toward greatness.

"Success is not final, failure is not fatal: It is the courage to continue that counts."

– Winston Churchill

"You may be disappointed if you fail, but you are doomed if you don't try."

– Beverly Sills

"It always seems impossible until it's done."

– Nelson Mandela

