MOMENT-CURVATURE ANALYSIS OF CONFINED CONCRETE SECTION IN UNCERTAINITY CONDITIONS MONTE-CARLO METHOD
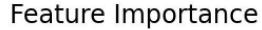
WRITTEN BY SALAR DELAVAR GHASHGHAEI (QASHQAI)
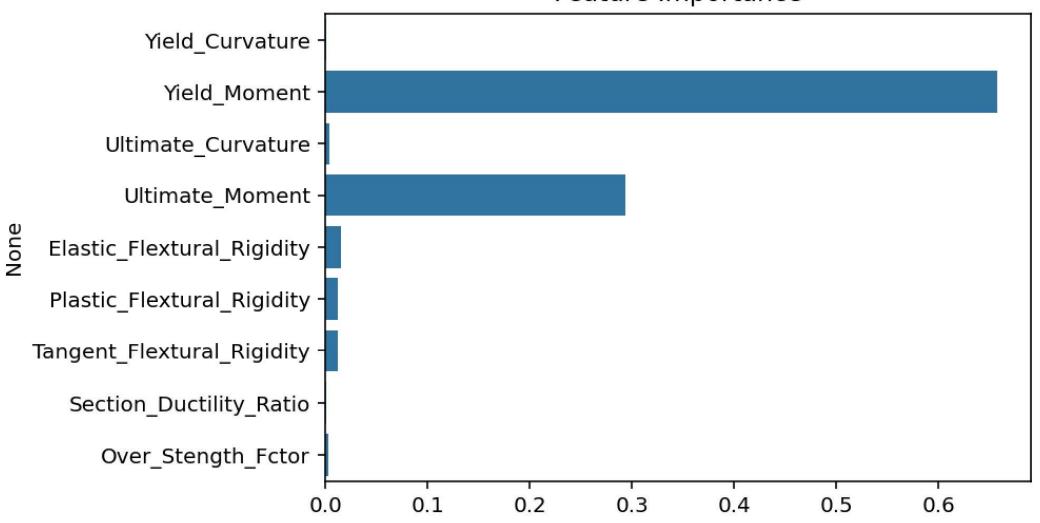
File Edit Search Source Run Debug Consoles Projects Tools View Help

...URVATURE\MOMENT_CURVATURE_UNCERTAINTY_CONFINED_CONCRETE

C:\Users\Dell\Desktop\OPENSEES_FILES\MOMENT_CURVA...MOMENT_CURVATURE_UNCERTAINTY_CONFINED_CONCRETE.py

MOMENT_CURVATURE_U...NFINED_CONCRETE.py

```python
################################################################################
#            >> IN THE NAME OF ALLAH, THE MOST GRACIOUS, THE MOST MERCIFUL <
#  MOMENT-CURVATURE ANALYSIS OF CONFINED CONCRETE SECTION IN UNCERTAINITY CONDI
#-------------------------------------------------------------------------------
#              THIS PROGRAM WRITTEN BY SALAR DELAVAR GHASHGHAEI (QA
#                     EMAIL: salar.d.ghashghaei@gmail.com
################################################################################
import random
import time as TI
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import openseespy.opensees as ops
import Analysis_Function as S02

# -----------------------------------------------------------------------------

def BILNEAR_CURVE(Cur, Mom, SLOPE_NODE):
    import numpy as np
    # bilinear fitting
    SIZE = len(Mom)
    hh = np.zeros(SIZE-1)
    Aa = np.zeros(SIZE-1)
    for i in range(SIZE-1):
        hh[i] = Cur[i+1] - Cur[i]
        Aa[i] = (Mom[i] + Mom[i+1]) * 0.5 * hh[i]

    Area = sum(Aa)
    k0 = Mom[SLOPE_NODE] / Cur[SLOPE_NODE]
    fiy = (Mom[i+1] * max(Cur) * 0.5 - Area) / (Mom[i+1] * 0.5 - k0 * max(Cur)
    My = k0 * fiy
    X = np.array([0, fiy, max(Cur)])
    Y = np.array([0, My, Mom[i+1]])
```
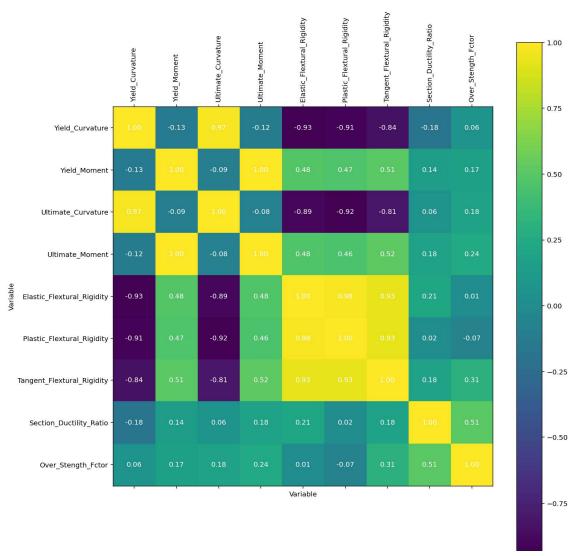
Correlation Heatmap

Help   Variable Explorer   Debugger   Plots   Files

Console 1/A

```
\users\dell\desktop\opensees_files\moment_curvature\moment_curvature_uncertainty_confined_con
crete\moment_curvature_uncertainty_confined_concrete.py:589: UserWarning: Attempt to set non-
positive ylim on a log-scaled axis will be ignored.
  plt.ylim(0, 1.0)
c:
\users\dell\desktop\opensees_files\moment_curvature\moment_curvature_uncertainty_confined_con
crete\moment_curvature_uncertainty_confined_concrete.py:627: UserWarning: Attempt to set non-
positive ylim on a log-scaled axis will be ignored.
  plt.ylim(0, 1.0)

In [3]:
```

IPython Console   History

Inline   Conda: anaconda3 (Python 3.12.7)   LSP: Python   Line 13, Col 32   UTF-8   CRLF   RW   Mem 28%

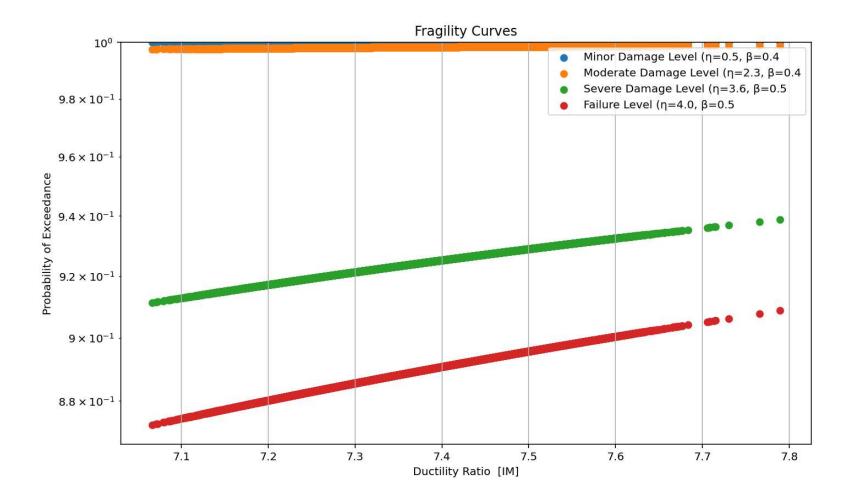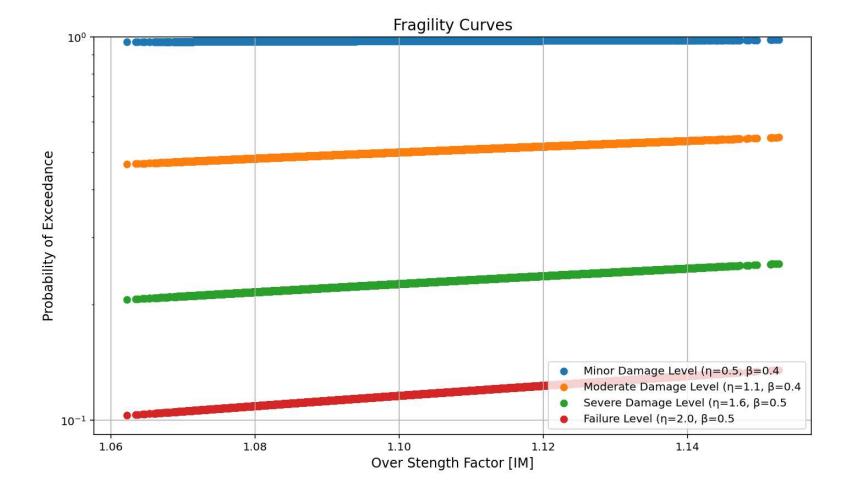RC Rectangular Section (ID: 1)

Correlation Heatmap

Feature Importance

Fragility Curves

Legend:
- Minor Damage Level (η=0.5, β=0.4
- Moderate Damage Level (η=2.3, β=0.4
- Severe Damage Level (η=3.6, β=0.5
- Failure Level (η=4.0, β=0.5

X-axis: Ductility Ratio [IM]

Y-axis: Probability of Exceedance

Fragility Curves

- Minor Damage Level (η=0.5, β=0.4
- Moderate Damage Level (η=1.1, β=0.4
- Severe Damage Level (η=1.6, β=0.5
- Failure Level (η=2.0, β=0.5

Probability of Exceedance

Over Stength Factor [IM]

Last Data of Moment-Curvature Analysis - Ductility Ratio: 1.0736 - Over Strength Factor: 7.3030

Concrete01 Material -- Zero Tensile Strength for Confined and Unconfined Section
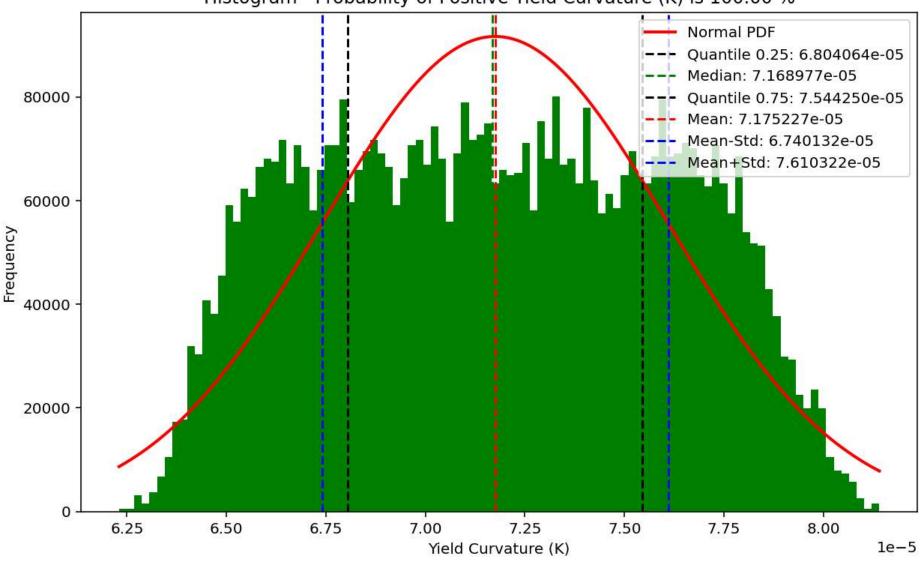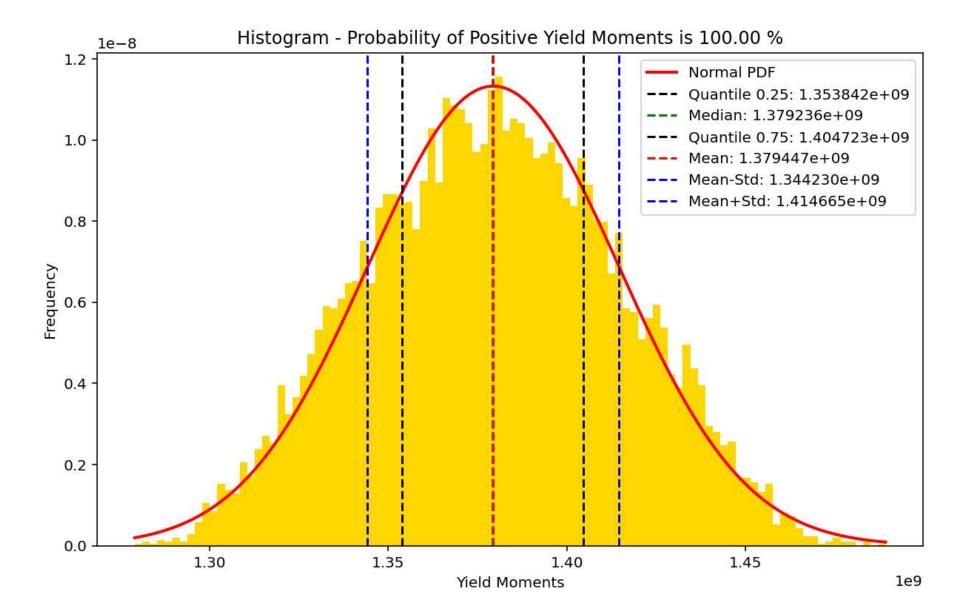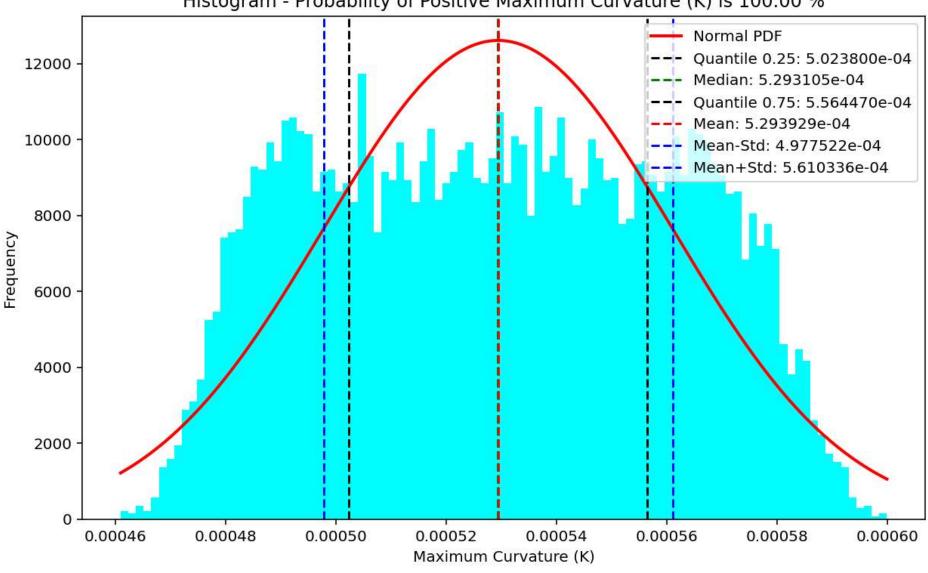
Bilinear steel Material for Rebar

Histogram - Probability of Positive Yield Curvature (K) is 100.00 %

Legend:
- Normal PDF
- Quantile 0.25: 6.804064e-05
- Median: 7.168977e-05
- Quantile 0.75: 7.544250e-05
- Mean: 7.175227e-05
- Mean-Std: 6.740132e-05
- Mean+Std: 7.610322e-05

Frequency

Yield Curvature (K)

1e−5
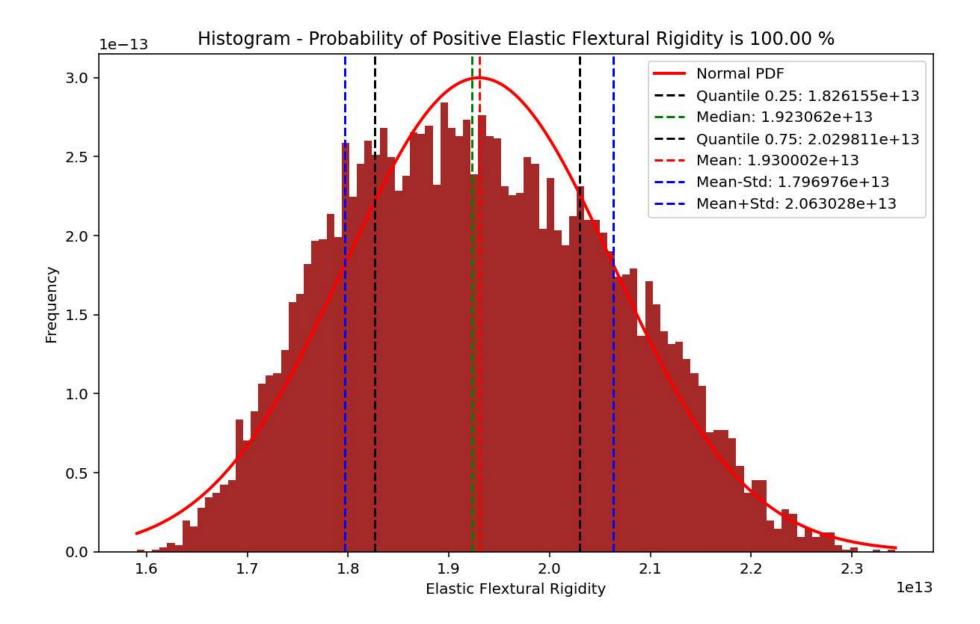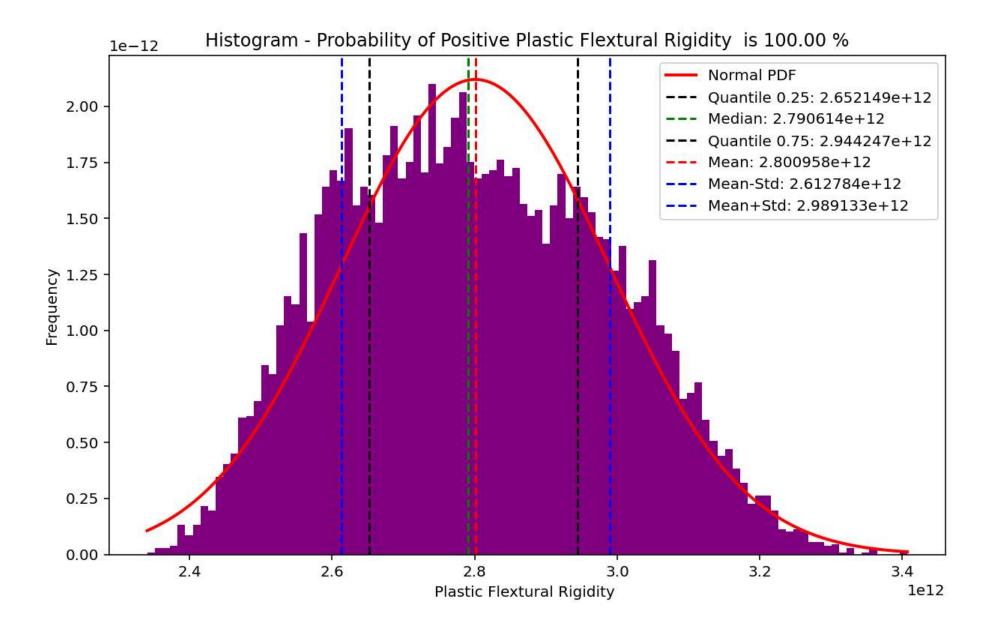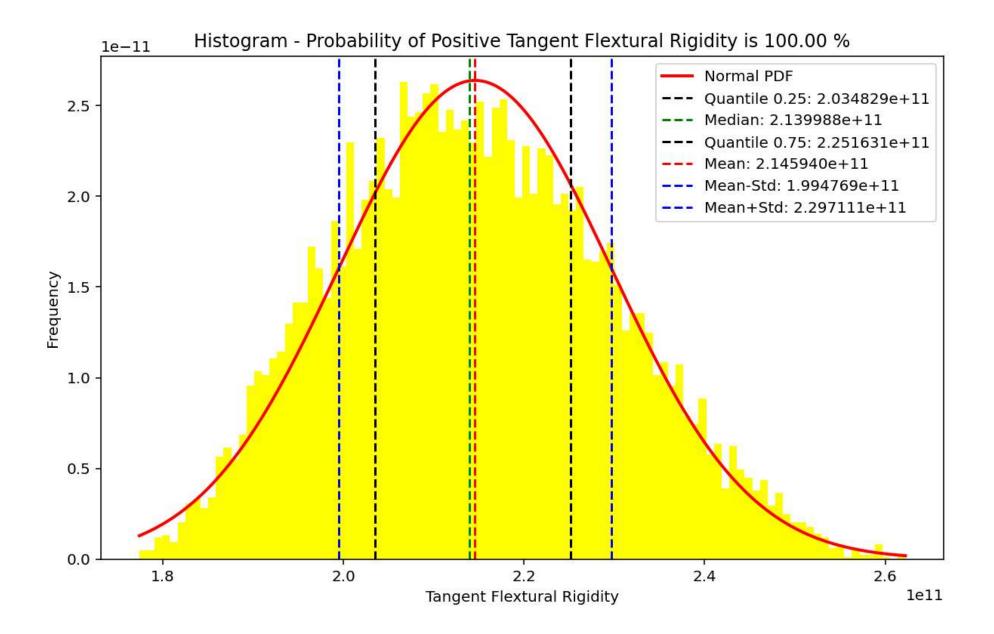
Histogram - Probability of Positive Maximum Curvature (K) is 100.00 %

Legend:
- Normal PDF
- Quantile 0.25: 5.023800e-04
- Median: 5.293105e-04
- Quantile 0.75: 5.564470e-04
- Mean: 5.293929e-04
- Mean-Std: 4.977522e-04
- Mean+Std: 5.610336e-04

X-axis: Maximum Curvature (K)
Y-axis: Frequency

Histogram - Probability of Positive Elastic Flextural Rigidity is 100.00 %

Legend:
- Normal PDF
- Quantile 0.25: 1.826155e+13
- Median: 1.923062e+13
- Quantile 0.75: 2.029811e+13
- Mean: 1.930002e+13
- Mean-Std: 1.796976e+13
- Mean+Std: 2.063028e+13

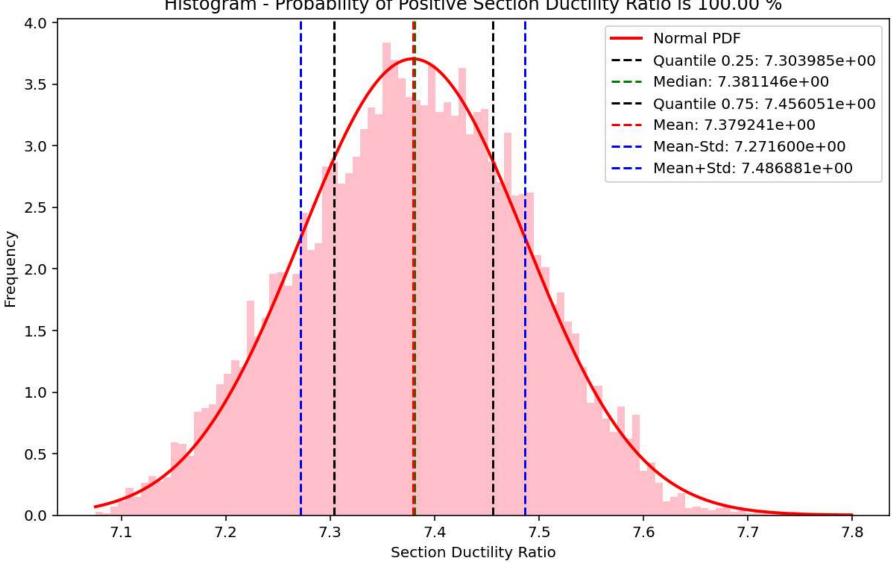X-axis: Elastic Flextural Rigidity
Y-axis: Frequency

Histogram - Probability of Positive Section Ductility Ratio is 100.00 %

Histogram - Probability of Positive Section Over Strength Factor is 100.00 %

Legend:
- Normal PDF
- Quantile 0.25: 1.069458e+00
- Median: 1.070998e+00
- Quantile 0.75: 1.072415e+00
- Mean: 1.070943e+00
- Mean-Std: 1.068851e+00
- Mean+Std: 1.073035e+00

X-axis: Section Over Strength Factor
Y-axis: Frequency