ESTUDO DE CASO - CRIAÇÃO DE AMOSTRAS

Importando bibliotecas

In [4]:
```
import sys
sys.path.insert(0, '../')
import fconcrete as fc
import pandas as pd
```

Aplicando o algorítmo de interação

In [3]:
```
>>> def criar_viga(base, altura, comprimento):
...         area_laje = comprimento*comprimento
...         carga_na_laje = fc.to_unit(5, "kN/m**2", "kN/cm**2")
...         carga_na_viga = -(carga_na_laje*area_laje/comprimento)/4
...         carga_distribuida_na_viga = fc.Load.UniformDistributedLoad(carga_na_viga, x_begin=0, x_end=comprim
ento)
...         n1 = fc.Node.SimpleSupport(x=0)
...         n2 = fc.Node.SimpleSupport(x=comprimento)
...         beam = fc.ConcreteBeam(
...             loads = [carga_distribuida_na_viga],
...             nodes = [n1, n2],
...             section = fc.Rectangle(base, altura),
...             division = 200,
...             consider_own_weight = True
...         )
...         return beam


>>> relatorio_completo, relatorio_de_solucoes, melhor_solucao = fc.Analysis.getBestSolution(criar_viga,
...                                       sort_by_multiplication=True,
...                                       base=(15, 110, 2),
...                                       altura=(15, 110, 2),
...                                       comprimento=(150, 1050, 50))
```

```
There are 41472 combinations. The estimate time to process all of them is 21744s (362 minutes).
Type 'y' to continue or another char to cancel.
y
Progress: |████████████████████████████████████████████████████████████| 100.0% Complete
```

Exportação das amostras para excel

In [4]:
```
relatorio_completo.to_excel("Dados de Custos.xlsx")
```

In [9]:
```
relatorio_completo
```

Out[9]:

	base	altura	comprimento	cost	error	Concrete	Longitudinal bar	Transversal bar
1	15	15	150	26.552389	NaN	11.92	6.60	8.02
2	17	15	150	28.636039	NaN	13.51	6.60	8.52
3	15	17	150	28.701879	NaN	13.51	6.67	8.52
4	15	19	150	30.851369	NaN	15.10	6.74	9.01
5	19	15	150	30.719689	NaN	15.10	6.60	9.01
6	17	17	150	30.997509	NaN	15.32	6.67	9.01
7	15	15	200	35.238586	NaN	15.90	8.64	10.70
8	15	21	150	33.000859	NaN	16.69	6.80	9.51
9	21	15	150	32.803339	NaN	16.69	6.60	9.51
10	17	19	150	33.358979	NaN	17.12	6.74	9.51
11	19	17	150	33.293139	NaN	17.12	6.67	9.51
12	15	17	200	38.082626	NaN	18.02	8.71	11.36
13	17	15	200	38.016786	NaN	18.02	8.64	11.36
14	23	15	150	34.886989	NaN	18.28	6.60	10.00
15	15	23	150	35.150349	NaN	18.28	6.87	10.00
16	17	21	150	35.720449	NaN	18.92	6.80	10.00
17	21	17	150	35.588769	NaN	18.92	6.67	10.00
18	19	19	150	35.866589	NaN	19.13	6.74	10.00
19	15	25	150	37.299839	NaN	19.87	6.93	10.49
20	15	15	250	43.924782	NaN	19.87	10.68	13.37
21	25	15	150	36.970639	NaN	19.87	6.60	10.49
22	19	15	200	40.794986	NaN	20.14	8.64	12.02
23	15	19	200	40.926666	NaN	20.14	8.77	12.02

	base	altura	comprimento	cost	error	Concrete	Longitudinal bar	Transversal bar
24	17	17	200	41.143466	NaN	20.42	8.71	12.02
25	23	17	150	37.884399	NaN	20.72	6.67	10.49
26	17	23	150	38.081919	NaN	20.72	6.87	10.49
27	21	19	150	38.374199	NaN	21.15	6.74	10.49
28	19	21	150	38.440039	NaN	21.15	6.80	10.49
29	27	15	150	39.054289	NaN	21.46	6.60	10.99
30	15	27	150	39.449329	NaN	21.46	7.00	10.99
...	...	...	...	...	...	...	...	...
41443	105	107	950	6084.743709	NaN	3770.86	627.99	1685.89
41444	107	105	950	6093.933144	NaN	3770.86	637.18	1685.89
41445	109	109	900	6009.792922	NaN	3777.80	589.67	1642.32
41446	99	109	1000	6237.918687	NaN	3812.46	684.38	1741.08
41447	109	99	1000	6280.755876	NaN	3812.46	727.22	1741.08
41448	101	107	1000	6253.673708	NaN	3818.11	694.48	1741.08
41449	107	101	1000	6277.566680	NaN	3818.11	718.38	1741.08
41450	103	105	1000	6261.866399	NaN	3820.94	699.85	1741.08
41451	105	103	1000	6270.326260	NaN	3820.94	708.31	1741.08
41452	105	109	950	6181.865459	NaN	3841.34	638.91	1701.61
41453	109	105	950	6191.608993	NaN	3841.34	648.65	1701.61
41454	107	107	950	6188.502370	NaN	3842.69	644.20	1701.61
41455	109	101	1000	6381.302738	NaN	3889.48	734.20	1757.62
41456	101	109	1000	6345.043095	NaN	3889.48	697.94	1757.62
41457	107	103	1000	6375.631764	NaN	3893.72	724.29	1757.62

	base	altura	comprimento	cost	error	Concrete	Longitudinal bar	Transversal bar
41458	103	107	1000	6357.316499	NaN	3893.72	705.98	1757.62
41459	105	105	1000	6369.321832	NaN	3895.13	716.57	1757.62
41460	109	107	950	6280.315084	NaN	3914.51	648.47	1717.33
41461	107	109	950	6273.162801	NaN	3914.51	641.32	1717.33
41462	103	109	1000	6445.939586	NaN	3966.50	705.28	1774.16
41463	109	103	1000	6469.875569	NaN	3966.50	729.21	1774.16
41464	107	105	1000	6464.162207	NaN	3969.33	720.68	1774.16
41465	105	107	1000	6459.073337	NaN	3969.33	715.59	1774.16
41466	109	109	950	6379.370132	NaN	3987.68	658.64	1733.05
41467	105	109	1000	6553.088147	NaN	4043.52	718.87	1790.70
41468	109	105	1000	6571.382734	NaN	4043.52	737.16	1790.70
41469	107	107	1000	6562.701902	NaN	4044.93	727.07	1790.70
41470	107	109	1000	6654.215575	NaN	4120.54	726.43	1807.25
41471	109	107	1000	6664.259070	NaN	4120.54	736.47	1807.25
41472	109	109	1000	6761.412937	NaN	4197.56	740.07	1823.79

41472 rows × 8 columns

Identificar as vigas menos custosas por comprimento de viga e tradução para compreensão do leitor

In [84]:
```
dados = full_report.copy()
dados = dados.rename(columns={
    "length": "comprimento",
    "width": "base",
    "height": "altura",
    "cost": "custo",
    "Concrete": "concreto",
    "Longitudinal bar": "barras longitudinais",
    "Transversal bar": "barras transversais"
})

dados = dados.drop(columns="error")

dados_menores_custos = pd.DataFrame(columns=dados.columns)
for comprimento in dados["comprimento"].unique():
    dados_do_comprimento = dados[dados["comprimento"] == comprimento]
    if sum(dados_do_comprimento["custo"] != -1)==0:
        continue
    menor_custo = min(dados_do_comprimento[(dados_do_comprimento["custo"] != -1)]["custo"])
    dados_do_comprimento = dados_do_comprimento[dados_do_comprimento["custo"] == menor_custo]
    dados_menores_custos.loc[comprimento] = dados_do_comprimento.iloc[0]
```

In [86]:
```
dados_menores_custos.to_excel("Dados de custo das melhores dimensoes.xlsx")
```

In [6]:
```
dados_menores_custos
```

Out[6]:

	base	altura	comprimento	custo	concreto	barras longitudinais	barras transversais
150	15	15	150	26.552389	11.92	6.60	8.02
200	15	15	200	35.238586	15.90	8.64	10.70
250	15	15	250	43.924782	19.87	10.68	13.37
300	15	19	300	61.904167	30.21	15.18	16.52
350	15	25	350	88.298648	46.37	19.19	22.74
400	15	29	400	119.126072	61.47	28.95	28.70
450	15	35	450	154.924409	83.47	36.89	34.57
500	15	41	500	201.408929	108.64	49.44	43.33
550	15	47	550	247.964731	136.99	57.89	53.08
600	15	53	600	300.256021	168.52	70.81	60.92
650	15	59	650	364.396778	203.24	88.76	72.40
700	15	65	700	436.807594	241.13	110.81	84.87
750	15	71	750	510.608829	282.20	133.72	94.69
800	15	79	800	599.797505	334.93	153.68	111.19
850	15	85	850	689.532881	382.89	180.11	126.54
900	15	91	900	785.570084	434.03	213.13	138.41
950	15	99	950	901.924097	498.42	245.30	158.20
1000	15	105	1000	1017.767634	556.45	284.89	176.43