```
!pip install face_recognition==1.3.0
     Collecting face_recognition==1.3.0
       Downloading face_recognition-1.3.0-py2.py3-none-any.whl (15 kB)
     Collecting face-recognition-models>=0.3.0 (from face_recognition==1.3.0)
       Downloading face_recognition_models-0.3.0.tar.gz (100.1 MB)
                                                  - 100.1/100.1 MB <mark>8.9 MB/s</mark> eta 0:00:00
       Preparing metadata (setup.py) ... done
     Requirement already satisfied: Click>=6.0 in /usr/local/lib/python3.10/dist-packages (from face_recognition==1.3.0) (8.1.7)
     Requirement already satisfied: dlib>=19.7 in /usr/local/lib/python3.10/dist-packages (from face_recognition==1.3.0) (19.24.2)
     Requirement already satisfied: numpy in /usr/local/lib/python3.10/dist-packages (from face_recognition==1.3.0) (1.23.5)
     Requirement already satisfied: Pillow in /usr/local/lib/python3.10/dist-packages (from face_recognition==1.3.0) (9.4.0)
     Building wheels for collected packages: face-recognition-models
       Building wheel for face-recognition-models (setup.py) ... done
       Created wheel for face-recognition-models: filename=face_recognition_models-0.3.0-py2.py3-none-any.whl size=100566170 sha256=f7421
      Stored in directory: /root/.cache/pip/wheels/7a/eb/cf/e9eced74122b679557f597bb7c8e4c739cfcac526db1fd523d
     Successfully built face-recognition-models
     Installing collected packages: face-recognition-models, face recognition
     Successfully installed face-recognition-models-0.3.0 face_recognition-1.3.0
# import necessary libraries
from PIL import Image # PIL : Python imagging library, image module allows reading and writing images with PIL
from PIL import ImageDraw # provides simple 2D graphics support for image object
import face_recognition # Find and manipulate facial features in pictures (REquires GPU)
from google.colab import files
files.upload()
\vdash
```

Choose Files pexels-phot...14796.jpeg

 $[\x81\\x00\x08\x1c\t\x1e\x15\xad\x82*$

• pexels-photo-6514796.jpeg(image/jpeg) - 47754 bytes, last modified: 11/20/2023 - 100% done

Saving pexels-photo-6514796.jpeg to pexels-photo-6514796.jpeg

{'pexels-photo-6514796.jpeg':

 $b'/xff/xd8/xff/xe0/x00/x10JFIF/x00/x01/x02/x01/x00H/x00H/x00/x00/xff/xe2/x02/x1cICC_PROFILE/x00/x01/x00/x00/x02/x0c1cms/x02/x10/XYZ$

 $\label{thm:condition} $$ \times 184 \times 1$

 $\label{label} $$ \xe^x96\xd3:x91\xac\xad\xcb\x1a\xa7\xa8\x0c.\xee\xf3\xfb\xde\xee\n6W\xd79q\xf4j\xaew\x7f\x0e\xec\xd6\xf4\x7f4\xf7\xbf\x9b\xfb_C\xa5\xd7\xce\xd3\x9d\?$

 $\label{label:lab$

 $\label{label} $$ \xe5{\x0f/\xa7\x97[\x86\xf1\xcd_\xbb_\xaeZ\xd3Y\xcb\xa9n\x9c\xd5\xf8{p\xeeG\xc1o\xa3]}g\xa9\x8b[\xad\xbbp\xd3\xe6\xee\xbe\xf1\xf9\xa2\x8am\xa6*FY@ R \xf2C\xaf\x01\xa2\xe1\x86$$

 $\x e8\xc6<\xa==f\xcd\x93\xe8\xf1\x17\xd4\xf6T\x98\xb=\x95\xdc\x7f1\x8b\xf2\xff\x00\x1f\xeb<\xbeY\x83\'\r\wuZ\xf2\xd3\xd0\x1\G\x85x7p\xf1sz>>\x8f?$

sW\x17\xaf\xb7\x95\xf1\x9d\xcf;\xc2\xc1\x13\x8d\x1bptk~\xa6\xe5\xfa\xf9\xf2\xf2i\xbb\xe7v\xc7\xabc\xda\x8e\xc71\xf4\x9e}\x1b\x97N\ \x87]\xd1\xf4\xb2\xca\xad\x18\x82*=k=\x87\x8e\xf4\x1e\xbe=\xee/[\x99\xed\xe5\xf6\xef\xe5\xfc\xde\xff\x00E\xd7\x83o\xd3\xf3\xd3\x\xe7\xbf5\x9b\x89\xb2\xbc\x7f7\xd0\xf9\xff\x006\x940\xe6\xa3\xa1_{r\x9e^\xec\xfa\x1b\xcc\xe3\xd0\xd7\xb7}

 $$ x03 \times 0x^2 \times 6x^2 \times$

 $@\times c2\times 040\times 8$ w\xb7U\xb9n\xab\xe2\x94Dd\x94\xf59;\xfbc\xd2\x14\xdd\xf4\xfc\xfe7\xcd\xfa\xcf-

 $\label{label} $$ xe1\timese^xe3\timese^xe6\timese$

 $0 \times x8c \times 96 \times d7 \times 15GX \times 7fm \times 23 \times fdn \times 25 \times d0 \times 24 \times 25 \times d0 \times 25 \times$

 $$$ <\infty50w\x83\xdc\xce\xe2,\xc7\xf3\xfe\x87\x94\xe4ty\xbd\xb9e\xc7v_0\x92\xc7\x9d\x1a\xc3\xda\xe2t\xb8w\xf7<\n<\xcf\x1e\xb3\xf9[\xa6\xp1e\xb6\xp1e$

 $$$ x99]\times c\xf5\xf8\x1e\xaf\xcf_{\kappa}\xf5\x9e}{o\xe7y}1\xeb\x07\x94t\xf5\x1b|%\x11\xdc\xe0V\xa3\x19\xd0\xa1\x02D\x04\x12Hj\n1\xd1\x9a\xb2\x96\xb2<\xd3\xf78}1\xeb\xdd?$

 $\label{label} $$ \x01\x80!\x95\xd7\xb0Q\xc0\xd1\xae\xb6\x9a\x1c\xac\xc8\x9e\xad\xfc\x95\x\xe9\xe8\xf1p\xd3\\xfax5\xd7eY\x9d5\x9e\xa5\xbc\xe1.\xb\x94\x81\x10\xac\x82-\xaa\x8e\x05\n^{x}\x90\x96\xa4\x05\x98$$

\x89d\xa2i\x13TKT\xac\xaa\xa5\x91J\x90\xc4F\x8c\xb28\x96\x056H

 $$ x8d x14 x86 xab x02R xb7Wb x99 x10 xb2 x05u x80 x84 x12 x03 x02R x0f x12 x1a x8d xe3 x1d ([Z xa9ybG x894 xf5 x11 x00_ x05d xae xcb x05 xc9* x06K.4 xbc xb6EiL x11 x86 xc0 x85A x15R xc3ZU x88 \n x03 \ K x12 x15 xad - x16T - \t5; x15 -$

 $"AQ2aq\x05\#0@B\x81\x14R\xa134Pb\x91\xb1\xc1$Cr\%\x82\xf0\x15DS`c\xa0\xa2\xb2\xb1\xe1\xf1\xff\xda\x00\x08\x01\x00\x01\x00\x01?$

 $\xb02\xff\xb00\xe4Z\x1c\xb0p\xbb[\xe6\xbf\x17\xfc\xa8cGV\x94\xccC*hv\x1f\x80\x7f\x87\x8f\x826B\x85\x1b\x1eC\x04\xf2\xeb{lk\tf\x97}-$

 $\x05\x11\x09u\x06\x06\x0eI\x98\xba\x8d\xd7\x9b\xd5\x0ch\xea\xd2\x9b\x88\xa6\xee\xb1\xea\x81\x07C\xc2QG\xf8eF\xdeX\xd1\xd1\xd1\xd2\x9c:*s1\x1e\x88$

 $e \times e^{x^{r}} \times e^{x^{r}} = e^{x^{r}} \times e^{x^{r}} \times$

\x95{>\xaf\\xa2\xfd[\xa2\xaa9\$\xa8\xf3\xa30%\x8b\x16\xd4\x0c\xfc\xaa\x9d\\xd3\xf0\x94\xccg\xe7\x11\xe8\x8b\xb7\x95\$.\x89\xd9\x14\xf4\xcd>\xa5\xc2]\xa8e\xe8m\x08p\x1e\tR\xa50\xc84@\x85G\xc4\xe1\xe7\xb0\xf0\x13|\xd3\xcb7\x04(:\x85\'9\xe3\x95\xc6\xe1\xe4\x99\x00\xa0\\Df<\xd3\x05\x94\xe3\xb2n\x9c\x14\xbff\xdfM\x83\xc2\x8a\xf6\x89\xf7\x8c\x1e\\\x0c\xd59\n\x85\\xdb\x84{\x8e\x1d\xae9\xa1T\x03\x9a\xab\\[\x84\x05\x05\xca\xa7\xedN\xd0\x82\x1c\'\xe5i\t3\xd9\x13\x15G\xa2\xa4\\xf3\xf8\xa2\xea\x8dd\xf8\x8fd\xe6\x8a\xae#

 $$ M\times94\times a_7\times e_4\times a_1\times f_2\times e_1. $ M\times94\times a_1\times f_2\times e_1. $ f_1\times e_1. $ M\times94\times a_1\times f_2\times e_1. $ f_1\times e$

 $\label{thm:linear} $$ \x6^x16(\xbe\xff\x00\xa6\xd1\xa0\n\x95\x07bis\x08L\xc36\x80\xc9<\x85\x8axq\x10\x88\xed\x9e\xcb\xach\x8c\xfe^\x8e\x89\xba'\xbc^*\x8b\xae\xf6k\xbc\xb3X\xea\xfb\xdcE+t\x01Wl=$

\xcaa"\xb76]\xa0\x0e\x1d\x0c)\x853\xf2\xf4\xbcI\xa8\xe8\xab\x8eB\x86\xa8\xd4yx9\x804[\xca\xbd3\xf5ST\xf9&S\xc4;BU\x1c%i\xe7~HP\xb69\\
AXZ\x85\x8fM!\xcdM\x191%b\x8d\xcf\n\xd0]\xab\xee\x98e\x81\xdc\x03\xe5\x98a\xda\xc2i\xcdn\xdeNb\x02\xaf\x87!\x873\xa7d)\xe6\x83Sh\xb{[\xaa\x1b\x07]\x83\x82\x8b\xa1\x95\x02\xfb*\x92Q\n\xb4~\x1e\x8f{v\x1e\x11\x9a:\xedk\xcbV\x1f\x1e\x08\xb5\xc34\xda\xb9-

 $s\times ht^{6}t\times cc\times ht^{4}x\oplus xe^{x0}\times ht^{2}x\oplus xe^$

 $\label{label} $$ \xa6\xdb)+\x833q\xba\xa1\xe9\xd9\n\x85\x99\x9dz\x904\xfc5\label$ \xc2\x15,+i\x0e\xe5U\x88U6\x8dP\xd1\x7fdDg\xb2P\xd9)\xc8*\x80\xdc\x89\x93\x10\xb14\x05(\xb7\x81\xd19|\x94\x17\xc3\x1b\xab\x8c*\x14E\n-$

 $\xf3r\xb8\xc0\xcd:\x90\xae\xc0\xf7G@U\xa6\xf89-$

 $\label{thm:limit} $$ \x30^xe3^xe3^xe1]x18^x86^xa7^xd6Cu^xdb^x9esU3^x12^x8ea^x1c^xf8No^x81^xd0^xa0^xa2^t\) $$ yj^x19^x04^xe5^x14^xe3^xc0^xc2^xc6^x97^xba^x02^xa4^xdd^xd50^xd6^xa3T^x84q^x1eJ^xa5^y0^xd1=xf1^xc0^xd0QAB^x8e^x16c^*-^x14f^x1cF^xf4^xcb^xfb^t^t^x93^xd1^xbf^x1f^t^xfb^xd3^x13^x8eH^x05]^xd9^xa3^x98N9p^xe1^xb2t^xa6^x9c^x93^x8a^xab^2^x60^xf6^xf8^x98?$

\x9b\xcd\xd6\x88\xec\xa4\x83i..7\x10m\xd1x\xaehw\xbch\x00\xba\xd5p<\xccp\r\x0e7r\xea\xa45\x93swvij\xa8`\x99

\xebYK\x7f\xcd6\x81m\xe9\xcd\x0c\xa8\x1bs\xfd\xe3\x9d\x07\xb2\xac`Y&\xeb5!;\xcb\x8a\x8dK\xda7\x80\xd4pv_\xca\xa4\x07\x0b\xa4\xd5\xb4
[\xd5\xea\xd8\xa7\x98;\xbf\xc8<H\xceB\xa7~[?

\xc1\x05\xa2\x9f5\xc2\xddQ\r-\xe6\xb3wk|\x94s\x1b\x83o\x97Y\x9a\xb6\x1b-\xa75,\x02\xd0\xe4\x1b\xb6\x7f+\\o~y\xe8\xad-

 $\label{thm:cab} $$ \xoo(xe1) xoo(xe1) xoo(xe1)$

 $\label{thm:condition} $$ \''; r'xdb'x95fxa3'xe4'xe5L'xec'x90'xa4]R(xa5B'xb5G'x1c'xf1'xdc'xaeW)R(xa4|95'xb2T'xfcIR'xae'xf9L'xf60'r'xc5'\U|xcavB'x8e('xdb*'xe5') Rag(0) Ra$

C\xe1w\x02cx%\xb0n\x19\x16\xa6\x9d\xe5\xc5\xb1\x8e\x8e\xb7\xa7\xbfbo\x9a\xaf5\xcc\x17d\x1f\xecK\xeb\xc1*xk\x88\x0bA\xf4\x96\xb6\xb6\xd3Q,er\x11`\x18\xf3\x14\xf5\x1f8\xa2}t\x7f\x8d\x08\x10\x8d\x93:e<b\\Q\xc7\x14X\xb1\xd4\x87\xc2t4~\x01\x86\xa6\x81*\x1a\x1d\x17\xedsx\x01\xa7\x86\xa5\xa1\x02Zy3hV\xc3@\x87\xdc`L\x97\xcc\x0c\xcb\x08\xe3\xb4\x1f17\xbd\xbf\xbc\xcf\x0c\x17\xfe\xf2\xee\x0c&\xa8\x5\xb6\x97\xf7\x86Tz

 $\label{label} $$ \operatorname{ln}x87C/xa1c_x19r\\xe1\\xa1\\xa1\\xa9\\xd2u8\\xc5Fa\\xb4\\xf1\\xcb&xad\\xa8\\xf9{\xa3\\xda\\xa5iyeX\\x93\\xc1\\n\\x8ce\\x\thetae\\xdc@q\\xb4\\xec\\xd9\\r1\\xe0.X\\xb5\\x82^x7f\\xdcB1b\\xe9\\x85\\xb9\\x95\\x18\\xb4-$

 $\label{label} $$ \xae^x86^x8b^x86^x80^xb2^xe5^xc3B^x10^xf82^xfc} $$ \xae^x86^x82^x1a^xb1^x97^xa8^xe80^xb2^xe5^xc3B^x10^xf82^xfc} $$ p\times1cFD^x10^x90^x86^x84^x80^-. $$ \xae^x86^x84^x80^-. $$ \xae^x86^x86^x84^x80^-. $$ \xae^x86^x84$

 $[\x89\xba\xcb\xb7{\x98\xbe\xc1j\xcb\x98\x88\x43\x8a\x93\xee\xd9]\x92\xe6\xd6\xx6a\xdc\xaa\xdc\xaa\xdc\xaa\xdc\x88\x95\xac\xe57\x98\x96\x12\xe6\x961\xf8\x97!\rm\xa73(\xb\x88\xf3\xb2\x97W\x88\x97\x85\x92\xa006:\xa3\xcb\xbe,\x96\x98\x19\x19\xacG(\x8b\xd2\x91\x1cKM\xb3t\xddJJ1\x9b\x9fa\xe6_fx\xf4\xfen\xd3T7Z#^,\x9b\xcbp\xff\x90\x91\x9b\x85\x91\x7fJck\n\x1f\xb9\x08\xb5t-$

 $\xb2\xc4\xc3\x11R\xd0\xda\\2\xd5\xd4@J]\xae\x04\x0c\xfa\xc2\xe8\xe3+\xfa\xcc\x03)u\x18\x1e\xa40\%\x99\xa2\ykd\x17\x87\x9cJ\xd1/\x9b\xc6\xcd!\xe6\xoc\xe2\xd8\xccJ\x16\'\x9b\xd5\x8ct~\x03\xa8\x97*$

 $$$ \times 11\times 9 = (x9a)\times 10^x 6^x84 \times 6^x84 \times 6^x84 \times 6^x84 \times 6^x9a); 2\times 9b\times 21\times 9b\times 21\times$

 $\label{label} $$ \ln x82\xea\x11\x19\xe5\xde5\xa9\xa30\x04\x11\xb2\xe1\xf0Xo\xaa\x1b\xc5\xddj\x12V\xda\x17\x13U\x97\xde6\xa7\xc9N\xdcKw.cj\x996\x96\xc0\x8a\x98\xc9\xc4\xbf\xc9n\xd0n\x14w\xd5\x8b\x16?$

 $$\x01\x0e^x10^x00^x11\x096\x06X\x8d\xd0\xd8\xe6\xd8\xf2\xca\x97\xd8\xc1G7)/w0&\xc9Tf,\xfa\x0e\x05\x82\x15\xa1\xab\xc8\xad\x94\x88\xba\xce\x10\xc3y\xbb\x18\xb3\xc0d\xfbB\x13(\x17\xdd\x88\xbe\xc6\x9e4b\xc6?$

 $\label{twoe} $$ \tx0e\x87Kb\xde\xe3\x96\x89B1\xc0\xe6P\x13\xbe\x98\xf1\xd0q\xa0{\x12\xa5(\xcaw\x97\x18\xc6?}$

 $\label{thm:prop:linear} $$ \frac{x_08j\\xe^x87\\xba]\\xc^x86\\xc^x98\\xae\\xae.\\x6.\\xe^x98\\xbe^xxe^x01\\xfc\\xe^x4.\\xe^x86\\xe^xe^x01\\xfc\\xe^x4.\\xe^x86\\xe^xe^x01\\xfc\\xe^x4.\\xe^x91\\y^x06\\xe^xxe^x01\\xfe\\xe^x01\\x$

 $\label{label} $$ \ln^xd5\xbfH\x06\xc4\x13\xbb\xc4\x19\x17a\xc4\xb8\xb1c\xf0\x9a\x1dX\x13\x03.F\xd4\xef\xd1\xbaxIW\xd9>x\x99i;\x90\xd0\xca\x86a-$

 $\label{label} $$x49@x8ff\timese5\xff\times00}\x18\xa6_xee\timese6\x1aa\timesc4\x11\xc1\timese4\times8e\timese6\timesd0\xd0\x17\x1f\timesc4o\timesf1\x00\n_\xa9\x10\x1aU\xc3\x02\Q\xc8\x955\xf2\x06\x7f\times9c\timesc2U\xd1n^{]}\x9ec\timesa4\x0c\times1d\x91m\xa0\xa0\xbc\xfd$

\xb6\xf4P\xc2tY2%K\x96\x96o)\xd8\x16_\xb4\xd8&\xde%;\x1f\x8d\x1ebn{\x9b]\r\xd7\x12\x8b\xdcLs?Z-

\xa8\xf4\x1d\xe6\xees\x19F\xd2\xff\x00_H\xd7\\x05v\x0f\x9b\x9f\xe7\xf6\xd1\xba\xc4\xc1\x94\\xbf1\xbeh

 $[\xf3\r[\xfci\xc5\x94\xed\xc4\xad\xfb\xca\x96\xc7s\x9d\x08e\xa8\x15\x17\xa8\x97\xa1iA\n^8\rwf\xe2\xafC\xeb\x1c\x96M\x8e4\x0eX3\x08\x8e\xc3\xc3\xc1\xe6\xbf\xa8\xb2\r\xdd\xa6\n\xd0\xe6\xb4/\xc1p\xde\xb4\xc2\xc1\xe6\xbf\xa8\xb2\r\xdd\xa6\n\xd0\xe6\xb4/\xc1p\xde\xb4\xdd\xcd\xc4\x19\Kmq)]\xb7\xba\x11\xcc\x15\xcb-$

 $a\x90m\x9a\x8ee\xb2\xf6\x03\xf6\xc4\xb3\x04-$

 $\label{label:lab$

 $F\times C2^xff\times 00\times 80\times 10^x 00\times 10^x 00\times$

 $\label{label} $$ \x0^0\x0^xe4\x87\xc6^[diX\xc9\xd0\xe80\x83\xa5\xebr\xe1\x96\xb4\xc6\xa6='A\xf1\x1d\x0c\xb0;]0\xd2\xec\xfcf\xfa\xbf\x0f\xa4\xc\x9e\xb1\xp1e\xc1\xp2\xb7\xdc\x88\xa9)\xd0\xp7('G\xb9y\xp4;?$

 $\label{thm:conder} $$ \x30e^xdf^x13x11\xb1\xaa\xb5FZW\xc0h^tS2\xefKh^tC[\x15\x96\x8et^xadk]\x8f^xc9r^xe5h^xa7\xb4\xae^xe6\xa3\xd4\xf4t^x01\xc4\xafm \xb4b]F/\xa2\xba\rs^xa65\xc4ty,\x99J$N\xd4\xa8i\xc6\x8b\xd5_\x0e<D&\x1bh}g\x82b\x89\x82Ah[\xb4\x8f^x8c\xda\x0f@\xe8\xbd1\x96K.:^\xdcq\x84\x0e^xf6\xe9\x11701eT\xe33hh\xc6\x9e\xb9GPu\xb9\xb3K\xd2\xf4\xb8f0\x1e^\xcbK\xb6\x96\xbbJ\xf5\xa9\x9d\x13LiQ\xc4\xbc\xbc\xf1\xc1\xb1\xd1\xf0\xe1\xf10\xff\xda\x00\x08\x01\x01\x00\x01?$

 $\label{thm:converse} $$ \xe0 \times 10 \times 03 \times 04 \times 86 M M \times ff \times 00 \times 95 \times 02 \times 04 \times 11 \times dc \times 12 \times a2J \times 89 \times a20 \times 19 \times 95 \times x89Y \times x64 \times d20Q \times 95 \times U \times c4 \times 89 \times 88 \times 12 \times a2J \times 89 \times a20 \times 19 \times 95 \times x89Y \times x64 \times a2J \times x89 \times x88 \times x12 \times a2J \times x89 \times x89Y \times x89Y$

SfX\xde&G\xa4\x96\xaa\xbc\n\xec\x80\x80\x16\'>:\xea\x16\x82\xd4,B\x84\x19\x87\xc1^9\x89q\xf0V<V%F

 $\label{label} $$ \xef\xcc\x9b\x8f\t\xf8\x86\enT\xe2\x01\xa4T\x004\xxcb.Q\x9c\xa8S\xa4\x98\xfb\x1cX\x89\xfe2\x11\xc1\x07\x13\xff\x00\xa3\xc0\x15\x06\x13L!\x18\xf8\xa5\xb0b:\x821\x8c\xfa\x81\x02\x12\xa9\x97\x80\xcc\x12\xbcX\xf8\x10K\x83P\xc9(\x13\x0b\xd9\xxf4e\xfd\x10\xdd\f\x1a\x8b\xb8\xb6\xx6f\x82T\xeQ\xb0\xf5\x1d\x7f\xa4\xbb\xf6\x02\x82\xd5\f\xbb\xc4-$

\xa8\xe9.\x1d[\xd1/\xe9\x06\x94\x0ea\xe1\x00\xb3\xd7P\r\t\xdc\xe5\x9a\x04\xec\x84?

 $\label{label} $$ \x af\x 0^x 0\x b 0\x b$

 $$ x85\x^96\x15]\nh\x82*S\xa1\x00(E\xfbx\xfe\xe2=\xa0\xc5\xf7\x14\xf2\r^\x00\xb4\xb4f\x9dK\xf1\x02\x88\xbc\x15\x97D\xb4\xd5\x95p\x97+q\xe2\x17\x02sP\xc1\xc0\xd0\xd7\xf9\\xc1\xc0\xd0\xd7\xf9\xc1\xc0\xd7\x1d\x03\x07\xb8E"-$

 $[\xe4\x95\xb0\xf3A\xff\x00\xaaPE\x8a\x03"\x13\x1f\x07\x0c\xc1\x8bR\xe3\x12\x04pG\x14Y\xf2\xf0^\xcc<\tx\xbf\x0017\x9a\x8b] $$ \xb8\x08\xab\xa6\xd8\xaeR\x7fP\x15u\\xcfP\xbe)\xc20,\x83\xec&\xff\x00\x9f\xf0\xa5\x8fg0\xcc^\x05?\xc0\x7f\xf2f\xa6? $$$

 $\label{thm:linear_control} $$ x16\xbf2\xbe\x1c\x9e\xa5A\xddB\xd3\x08\xc8\x9c\xa5A\xd0B\xd3\xb2\,6\xc1=T\xcfS$\x0e\x98\x10M\xc4\xbc\xc7\x11g\xc2\xc6\xa6\x02\x86\xc1\xf0\x19vF\\xa58\x12\xe5\xb6B\xca~\x8f\xf7=\tC\x19!\xa7"f\xab\\n\xe2\xc0m\xb5\xdf\xcd\xd7\xe60\xc5$$

 $\label{thm:linear} $$ \frac{x_1d_x07''_xd_3x_1dH_xa7m_xb_1X_xdb_xe7D0)_xdf_9w_{x9f^xc7+xea}_R>xcd_xff_x00\\x13_x89_x92_xbd_,x94_xd_3\\xe2_xd4_xdai_x0c_r@_x81G_x82_xd_xe2_xd60x__)_xf_2_xe8n_xa1_x07_xc0_xe2_xb13_xceC_xf7_x1_b_xc8_xd4_xe2_xeb__xf7_xa8_xe2_xcd_xban_xec_xe3_xbe+x98_x1b_xc4_xb0_xd4_xb9i_x1e_xc9_x8b_xf3_x9f_xcc?$

 $\label{thm:condense} $$ \xo6\xef^{0.0}_U^14\xe0\xe1\xef^{0.0}_U^14\xe0\xe1\xef^{0.0}_U^14\xe0\xef^{0.0}_U^14\xe0\xef^{0.0}_U^14\xe0\xef^{0.0}_U^14\xe0\xef^{0.0}_U^14\xe0\xef^{0.0}_U^14\xe0\xef^{0.0}_U^14\xe0\xef^{0.0}_U^14\xef^{0$

ELIMAN 1.00-1.100-1.100 1.100

 $\label{thm:cond} $$x10\times8e^x8aA\xf2\timesee^xe5\x95+\xad0\xb5k\xea/\x06\xc64\x08H\xdc\xe9\xd9\x19\xa2\xb4\xa2\x03\xe9\x99\x88\x949\x97\tV\x90\xd4\xc5\xb7\xag\xaf\x88\xcef\xb4 |x96?$

dV<s\xb6\xb8\xd8\xfd\x8f\xc3\xf7\x1b\xb3\x10\xca\x9fA\x93\$\xad\x06\xf4\x97\x17\x81E\x16,b\xc6\\\xb9~\x1a@\xb6q8\xf0c\x17\>
V\x1d)\xf3\xdc\x1b\xb1\xfc\xf1\xe9\x95\xb4\xe9\x97\xed\xfc\xc60h\x8d7Y!\xdc-

 $\label{thm:cocxed} $$ \x00.xe0\x80^x\x80^x\x90.xe0\x80^x\x80^x\x90^x\x$

 $\x82S\x8c\x1b}\xcd\xa62\xbbL0Ta\x8e\xc3Q\xae\x8a\x8a\x8a\xaaLS0\x1f\&`J\x8cQ`M*\xfe*\#\xd6\xf0\x96\xaa\xce9\x80+f7g\x87\xfe\xe6eN\xa0 4\xac=\xbf0\x87\x1a\xf4\t;\xf4\xd9Mf=\xfd sYo\x1fP\xd6\x14o\xb3nw.\x94m`\x83\x9a.\xa5fz\x94:A\xd2\xbbz\x97$

 $$$ V\times d1_x03\times f^xe^x6B\times a2\xf1E\xd0\xf1y\&Sj\x1d\xceV\xc2\xea\xd0\xb6V\\xb9w\x16,X\xff\x00\x06\xo6\xo9\x12\xa1\xaa\xb5A\x97\xf41\xce\xfb\x02\xb4\x12\%\xc9\x90\x8d\x8a\xa6\xe4\xb9\x16}E\x9a\x1a\xb5\x0b\xab\x9eq\xcc\x10\xa4;\x0b\n8:s\x15I\xe2\x1\xbf\xb6\x87\xfe\xec\r\xd1\xa6\x9f\xdc\xaeE5\xf1=D\xbc\xb3\x98U\xe7q\x12\x06o\x8a\x0CH-$

 $\x 18 x 13 x 6 t D X ~* x d X e 0 x 0 3 x c 5 x 2 x 9 4 x d e - d x 1 b + x a f x 8 u x 0 7 x 8 d x 9 b x d d K m x 0 4 x 0 3 x b 2 x b 8 x e 2 - d x 0 f x 6 x 0 f x$

 $y@\x83\xd2\xb5\xca\xee\x93\x1dC''\x08\xa8\t\xb2\xfcnq\xe9B\xdd\x14\xae\xbe\xb9\xb8\xfaG\x92\xcb\x12\x02.C;\xed\x8d(M\xd5\x18\x99L\x^7\x95\xb1^\x00A\xfd0T,QE+gDh+\x00\x94\xc5\xbfm\x08\xae\xe1\xb7t\xd8-$

 $$\x08\x38[k\x9f\x88{fXA}\x1a\x34\xf2\xe2ehn<\xc70fe\xe1\x0f\x0b\x97\xe9\x88\x05!\x174\x7f\xb8\xe5N\xdd>\x1b\xf6A]\xbc\xdd\xfc} $$\xb5\x0b6\xbc\xe2\xbf\xaf\x0b\x99\x04 \xca\x18\x1d\xb2\xfa\xb4x$

]\xdd\xa4\xf6\x97\x1e\xad\xb6\x98\xa8_\xca\xa7\xba\x8e\x87X\xa0\\$6s`\xfa\x80\x10Qj=\\6\x1a3\xd0C\x00\x19Mt\xfb\x882\xcc\$\x0e\x93\x98\x01\xb5h\x80v\xcbk\xba\x00S\xda\xe2\x00\x93x\x10\xe2{]\x13\xb9\x04_\xca\x9a\xae\xd0\xd0\x82j7\xd8\x0f\xe6\x88\xc5\xb2d\r\xae\xe1N\xae\xe1N\xa9\xb2\t\xb4E\x83\xa98*\t\xeb\xd8b\x1\xe8b\xaf\xa6\x01X\xac\xc3\x00;o1!\xc2\xb5\xabe\xc4)\x8e\x1e\x99\x9d\xe4)\x972\xe0u\xr5\\xb4-\xa3X\xe0\x99\x\x84\xc20\x8e\xa2LK\xcc\xf7\x1d\x93\x10\xe4\xcc?

\x8a\x0ev\xf0\x9bx\x99gy\x9d!\x06Rm\x17v.\xfe\xe1j\xa0\x1a>;~?

 $$$ \times N^1_4 \times 0^1_{x^2} \times 0^1$

 $bM\x02@\x03\x1a\x01\xec/\xf3.\xa8D9\x8a\x90\x94\xea!\xd1Xb\x18rL\xa6\xbf\xf5\x08\xd0\xf60\x8d\x00@\xecAPU\xf0!\xc7\xc8\x13\x14\xa6MZ\x03\xdc\x1a7\xf9\x8a\xc2\xc9\x97Q\x0e\x98\x8a\xbcV\xcfi]\xed\x04\xc5\xbe\x9efQWN\xe5\x07\#*b\t\x06\xc6\xe1E\xf3\x11\xbb\xf1\x16\x0e.)\xb85k\x97\xd1\xcc\x11\x08\xa9\xaa\xd4\xcb\x8f\xd4\x01\xb0e\xb4\%i\}Ne+\x84\x8ar\x93\nU\x90\xd4\xa6\xc2\xfe\xd3Y\xke9p!\x1d.!^\xe0\xb4$

 $\xc4Q\xb0:\xd2+#)\x85\x953=\xb0\x846]\xf9\x1a`\xc51-$

 $\label{thm:cond_transform} $$ \xc4\timesx60LC\times f73\xb2V\times af\xa4\x15\timesxd7\times d_{xf2\times88k}\xe8p\xfdq\x06\timesx8f\xd1++Gg\xfbgf\xf2\timesy6\xd8\xad\xc4\timesxff\x00f\xa02\xp\xb3\x87\timesxea/\x00\xb3\xb3\xc2\xf8\x81\xea/\x95\xc7G\x16\xd7\xa9\times\xd6\xf3\y2\xf8\x81\xea/\x95\xcf\G^/\xf9\7\x1d\xc31p\x10S\xf2~\x88\x86\xf6\x82\xee\x02\x05Bm#u\xd40\xca29\x97\xe4\xc3\xed\xb2\x1c\x18\x0f\x8ea\xaa\xff\x00!\xc4\xct\xee\xe7r}\xe2\xe3\x02-\x82W\xb8\x14\x006\xae\x89v\xd0\x1a\xf9\xad\x1f\x10\x8dckhX\xea4k\xb6\$

 $(\xba\xf6M\x8f/\xea\x00|K\xb9\xb8\xb6)\x0b\xe1A\xef\xa9F\x0e\x0c\x10\xb4G\x81G!\x96f\xb5\xc2Q\xc6\x0eF)X\h\\xafoZ\x81y}\x00\x1c8\x6x96\xb0\xfb\x12)\x94wx\{cq[R\x9d\xab\xb9\xe9\x001]\x91\xf6\};\x97\xb8\x18M\x16\x82\x0e?$

```
\x80\xa0\xde\xb7\xa9\xc74\xb2\xea\x9f\x1fq]\x96\x88\x0ej\x96\xfe\xdc1\xa3\x9c\x96\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe7Ye-\xe
                   9\x95\x96\xc2\xbf,r%\xe8\xba\xc1\xf2\xe5\xf7\xe2\xea\x1a?
                   \x 85 x c 1 x f 2 x 1 f 7 p x 8 b r x 6 x 9 9 6 x 9 8 B x e 5 x e 4! x 13 d x a 8 = x f 9 x b f x 0 1 d x c b x 8 b x 8 d x e 6 x e 7 x 8 d x a 6 x e 7 x e 6 x e 7 x e 6 x e 7 x e 6 x e 7 x e 6 x e 7 x e 6 x e 7 x e 6 x e 7 x e 6 x e 7 x e 6 x e 7 x e 6 x e 7 x e 6 x e 7 x e 6 x e 7 x e 6 x e 7 x e 6 x e 7 x e 6 x e 7 x e 6 x e 7 x e 6 x e 7 x e 6 x e 7 x e 6 x e 7 x e 6 x e 7 x e 6 x e 7 x e 6 x e 7 x e 6 x e 7 x e 7 x e 6 x e 7 x e 7 x e 7 x e 6 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x e 7 x 
                   CC\xa1,\xf0+\xe7\x89\x9ep\x00\x14\xdd\xdeS\xea(\xc6\xee\x99\xf4\xbc\xc0L\xc0\x16r\xf2\xe6Q\xaa\xd7\xb9@\xc3@\x9b\x1a\xf9HeT\xa4`\x16
                   \label{label} $$ \xe1Pe\timese6\times1b\times84\timesb3\times9a\timesb1\timesf9F\times01\timesd1\times05i\times00\times88G\timesb3]\times86\timesb4\timesa8\timesa5A\timesb2\times1b\times84F\timescf\times04pP\timesa6\timesebR\timesa5Xa5A\timesb2B\timesa6Xa5A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6AXa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A\timesb3Xa6A
                   0\xe1\tR\xea>G@8\xe9\x83\x04\xd8\x1b\x87\x14Q[\xc4d\x92\xd87tE:\x9a]
                   P\xfcu\xd2\%\xc9W\x96+ek\xb8F\r\x10Cf\xfcs\x8b\xc1\xb7:?\x80<X-
                  \xf70Hv\xb06\xa9\xdbX=L\xdb:\xd8\xa7\x12\x9d\xa0\xa2\xce\%6)\x06B\xd4\x17\xc5S:_\x10b\x8c^\xcd\xcc\x92\xe2\xb4\xc7\xa5\xcaj\xeaj\xe0Thermore
                   0 \times 800 f \times f 0 G \times b 2 f K \times 14[1^9 \times 90 \times c7, \times 90 
                   <x83=k\\xea\\x10\\xd7\\x16\\xa0\\x96\\xff\\x00\\xf6d$\\t\\xa2\\x02\\x15,\\x88p\\x85\\xc0Xn\\xddm!\\xe8\\xa0q\\x7fR\\xe6\\xbc\\x02+N\\xda^\\xad\\xdc\\xbc\\x02+N\\xda^\\xad\\xdc\\xbc\\x02+N\\xda^\\xdd\\xdc\\xbc\\xde^{1}
                   T\xfc\x1f\xdcc\x8f\x1c\x03;\x9b\xbf1\xaa\x97\xe0\xf0\xe2kR\x9c\xe3\xc3\xb6\x90\x9c-
                     _\xc4\xd4\xa6\xb4k\x0e\xf8UM\xedx>k\x7f1\x8c\xb9p\xf9\x95\xee\x04\x1a`9\x80\x95`\x1f\x1f\xfc\xb1mjc\xdd\x12\xda\xfb\x86\x88\xdd\x9ba
                   xf1wA\x08\x02\xb8\xa6\x92\xa0\x95\x83\xa67\x98\x81\x9c
                   \r\xaaX\x03\x97\x96\x9e$\xdb\r\xab\x0c\xe2\x1a\xd4\xae\x89\x19"]\x0b\xb7\xf6\x9a\xf0\x91\xa8,\xa9\x8b\xc8\xb2\x04\x83-
                    \x000\x80\x9b2\x7f\x86\x14\xb0/\x08h\xb0/\x06s\x18\x88\r+\xb8A\x004\x88\x02\xff\x00\x0b\xf9\x8eA_\x1f\xa9ou\x9b\xf9\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x10c\%\x1
                   \label{eq:kxd6} $$ K\times d6^{xec\times2X\times1d\times95\times69\timesc5^{+};*xc8\timesa0\times86} \times 1a^{x0b\times08E\times2\timeseb}n\times b^{x00}.$$
                   (\xa0\xf4\x03\xf0\xc1\xcd\x0e\x86=\xe82\xb7\xf6\ s\x93A*\xa9F\xfax\x86N\%\#wP\xe0Q\xb5:\xe6\x1cN\x00\x97W\xcd\xf7\xfa
                   \x880\x9b\xcf\x97\xbe\x820d*cF\x9cu\xf3\x197\xa4J\x03\x9c\x1b\xaa\xc7g"\x92\x9a9\x02.
                   (x01\x05)\x080\xfaS(\n\x85V.lk1\xccf\xe3\x05\x06\xd54\%M\x01;U\xee\xaf\x14Z,\xa4K\x02A\x08\xe6\x9a\x80\xaaR1\xc6\xd4(\xb1\xa0\xcd\xa0)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xb1\xab)\xab(\xab)\xab(\xab)\xab(\xab)\xab(\xab)\xab(\xab)\xab(\xab)\xab(\xab)\xab(\xab)\xab(\xab)\xab(\xab)\xab(\xab)\xab(\xab)\xab(\xab)\xab(\xab)\xab(\xab)\xab(\xab)\xab(\xab)\xab(\xab)\xab(\xab)\xab(\xab)\xab(\xab)\xab(\xab)\xab(\xab)\xab(\xab)\xab(\xab)\xab(\xab)\xab(\xab)\xab(\xab)\xab(\xab)\xab(\xab)\xab(\xab)\xab(\xab)\xab(\xab)\xab(\xab)\xab(\xab)\xab(\xab)\xab(\xab)\xab(\xab)\xab(\xab)\xab(\xab)\xab(\xab)\xab(\xab)\xab(\xab)\xab(\xab)\xab(\xab)\xab(\xab)\xab(\xab)\xab(\xab)\xab(\xab)\xab(\xab)\xab(\xab)\
                               al vool voal vdal al voal vdhi vahi vool vool vari vhol l l vool vaol v£4hhpl vdri vaolvmh vaol vahci voel voe
#loads an image file (.jpg , png, etc ) into a numpy array
image = face_recognition.load_image_file("pexels-photo-6514796.jpeg") # Return a list of face locations in which each face locate
                   \ \u24\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\\u26\
#find all the faces in an image
face_locations= face_recognition.face_locations(image) # Returns a list of face locations in which each face location is a tuple pf pixe
print(face_locations)
                   [(308, 349, 370, 287), (153, 319, 205, 268), (233, 453, 276, 410), (191, 211, 253, 149)]
                   %v\vh9Rd\vxd\vxf\vff\vAA\vrr\vh7\vhh*&5\v7\vxp\vxp\v7p\vrd\vr7\vr7\vxp\vqf\vqf\vqh\un\v4h\un\vq6\vxp\\vxd\vxd\vxp\vxp\vrd\vrd\vxr
#loop over each face
for location in face_locations:
       #print the locations of each face in the image
      Top,right,bottom,left= location
      print("Top: {}, right:{}, bottom:{}, left: {}".format(Top,right,bottom,left))
                   Top: 308, right:349, bottom:370, left: 287
                   Top: 153, right:319, bottom:205, left: 268
                   Top: 233, right:453, bottom:276, left: 410
                   Top: 191, right:211, bottom:253, left: 149
                   #number of faces in the image
numFaces=len(face_locations)
print(numFaces)
                   #load the image into a python image library object
Pil_image=Image.fromarray(image) #convert array to image
                   #loop over each face
for location in face locations:
       Top,right,bottom, left = location
      #Draw a box around the face
       draw=ImageDraw.Draw(Pil_image) # Create a Draw object
      draw.rectangle([left, Top, right, bottom], outline='red', width=2) #Use rectangle drawing method
       from matplotlib.pyplot import imshow
       imshow(Pil_image) #Display data as an image
```



find all the facial features in all the faces in the image face_landmarks_list=face_recognition.face_landmarks(image) #returns a dict of face feature locations (eyes,nose,mouth,lips,etc) print(face_landmarks_list)

```
[{'chin': [(288, 328), (289, 336), (289, 343), (290, 350), (292, 357), (296, 363), (301, 368), (307, 372), (314, 373), (322, 372),
```

```
#loop over each face
for landmark in face_landmarks_list:
#loop over each facial features (eye,nose, mouthm lips etc)
 for landmark_name, list_of_points in landmark.items(): # items(): returns a view object that displays a list of
#print the location of each facial feature in this image
    print("The {} in this face has the following points: {}".format(landmark name,list of points))
#tace out each facial features in the image with a line
draw.line(list_of_points, fill="blue", width=2) #Draw a line between the coordinates
     The chin in this face has the following points: [(288, 328), (289, 336), (289, 343), (290, 350), (292, 357), (296, 363), (301, 368),
     The left_eyebrow in this face has the following points: [(294, 323), (297, 320), (302, 320), (307, 321), (312, 323)]
     The right_eyebrow in this face has the following points: [(320, 323), (324, 321), (329, 319), (334, 319), (338, 322)]
     The nose_bridge in this face has the following points: [(316, 328), (315, 333), (315, 337), (315, 342)]
     The nose_tip in this face has the following points: [(310, 345), (312, 345), (315, 346), (318, 345), (321, 345)]
The left_eye in this face has the following points: [(300, 329), (303, 327), (306, 327), (309, 329), (305, 330), (302, 330)]
     The right_eye in this face has the following points: [(323, 329), (325, 327), (329, 327), (332, 328), (329, 330), (326, 330)]
```

```
The top_lip in this face has the following points: [(304, 354), (308, 352), (312, 351), (316, 352), (319, 351), (323, 351), (328, 352),
The bottom_lip in this face has the following points: [(328, 353), (323, 358), (319, 360), (315, 361), (312, 360), (308, 358), (304,
The chin in this face has the following points: [(271, 170), (272, 176), (274, 182), (276, 188), (279, 193), (283, 198), (288, 201),
The left_eyebrow in this face has the following points: [(272, 168), (274, 164), (277, 163), (281, 163), (286, 164)]
The right_eyebrow in this face has the following points: [(294, 162), (298, 160), (302, 158), (307, 158), (311, 160)]
The nose_bridge in this face has the following points: [(291, 167), (291, 171), (291, 175), (292, 180)]
The nose_tip in this face has the following points: [(288, 183), (291, 183), (294, 183), (296, 182), (299, 181)]
The left_eye in this face has the following points: [(278, 171), (280, 169), (283, 168), (286, 169), (283, 171), (280, 171)]
The right_eye in this face has the following points: [(298, 167), (300, 165), (303, 164), (306, 165), (304, 166), (301, 167)]
The top_lip in this face has the following points: [(286, 190), (289, 189), (292, 189), (295, 189), (297, 188), (302, 187), (306, 18
The bottom_lip in this face has the following points: [(306, 186), (303, 191), (299, 193), (296, 194), (294, 194), (290, 193), (286,
The chin in this face has the following points: [(412, 253), (413, 258), (414, 263), (414, 267), (417, 272), (420, 275), (426, 277),
The left_eyebrow in this face has the following points: [(414, 246), (416, 243), (420, 241), (424, 240), (428, 241)]
The right_eyebrow in this face has the following points: [(436, 240), (440, 238), (444, 237), (448, 238), (452, 241)]
The nose_bridge in this face has the following points: [(433, 245), (433, 248), (434, 251), (434, 255)]
The nose_tip in this face has the following points: [(430, 258), (432, 258), (435, 259), (437, 258), (439, 257)]
The left_eye in this face has the following points: [(419, 248), (421, 246), (424, 245), (427, 247), (424, 247), (422, 248)]
The right_eye in this face has the following points: [(440, 245), (442, 243), (445, 243), (448, 244), (445, 245), (442, 245)]
The top_lip in this face has the following points: [(426, 266), (430, 264), (433, 262), (435, 262), (438, 261), (441, 262), (446, 26
The bottom_lip in this face has the following points: [(446, 263), (442, 265), (439, 266), (436, 267), (434, 267), (430, 267), (426,
The chin in this face has the following points: [(156, 206), (155, 212), (155, 218), (155, 225), (156, 232), (159, 238), (163, 243),
The left_eyebrow in this face has the following points: [(159, 202), (162, 198), (167, 197), (171, 198), (176, 201)]
The right_eyebrow in this face has the following points: [(184, 202), (189, 200), (195, 200), (200, 202), (202, 206)] The nose_bridge in this face has the following points: [(180, 205), (179, 209), (178, 213), (178, 217)]
The nose_tip in this face has the following points: [(172, 220), (175, 221), (177, 222), (180, 221), (183, 221)]
The left_eye in this face has the following points: [(164, 206), (167, 204), (170, 204), (173, 206), (170, 207), (166, 206)]
The right_eye in this face has the following points: [(187, 208), (190, 207), (194, 207), (196, 210), (193, 210), (190, 209)]
The top_lip in this face has the following points: [(166, 227), (170, 226), (173, 226), (176, 226), (180, 226), (184, 227), (188, 25)
The bottom_lip in this face has the following points: [(188, 230), (183, 233), (179, 234), (176, 234), (172, 233), (169, 231), (166,
```

imshow(Pil image)

<matplotlib.image.AxesImage at 0x7cd047f57af0>



#generate the face encoding
#face encoding: A set of 128 measurements pertaining to facial
face_encodings = face_recognition.face_encodings(image)

print(face encodings[0])

```
[-0.05650221 \quad 0.08063693 \quad 0.05310322 \quad -0.00132483 \quad 0.01846655 \quad -0.10101923 \quad -0.00132483 \quad 0.01846655 \quad -0.10101923 \quad -0.00132483 \quad -0.001324848 \quad -0.00132484 \quad -0.001324848 \quad -
    -0.18436506 -0.06559805 0.02360095 0.11435598 -0.15084748 -0.07130349
  -0.06618333 -0.03184713 0.07310598 -0.02424819 0.11910614 -0.02161946
  -0.10112044 -0.37642479 -0.12694359 -0.10914588 0.01444153 0.01595667
   -0.00774453 -0.01533461 0.21189213 -0.00854161 -0.18262994 0.01159495
   0.00885826 0.19258076 0.14514397 0.01507853 0.06188073 -0.07889622
   0.04107583 -0.18829028 0.01178426 0.10592129 0.05773814 0.01925868
   0.061374 -0.08315782 -0.00250089 0.03862229 -0.17677578 0.05791203
   0.13145703 \ -0.07027361 \ -0.04453637 \ \ 0.01704235 \ \ 0.09634592 \ \ 0.06231426
  -0.05810188 -0.09999506 0.10335405 -0.0991191
                                                                                                                        0.04261892 -0.006186
  -0.11436948 -0.22023454 -0.28577137 0.04531102 0.41826856
  0.02725303 -0.08518404 0.08417042 0.12247917 -0.10483877
  -0.0413275
  0.05312046 -0.10571219 -0.04383621 0.09489743 -0.16411629
  -0.0189434
   0.17558552  0.20968264 -0.04948496  0.17238507  0.02565608  0.07030515
    0.00730744 \quad 0.05233821 \quad -0.10560808 \quad -0.09533525 \quad 0.01577231 \quad 0.14478265
   0.03155017 0.0132533 ]
```