Testing

Testing di Robustezza

Testing sul numero di input

```
load mathwork200.mat;
[R, OUT, IN] = PageRank();
```

```
Error using PageRank (line 5)
Inserire come parametro di input la matrice G
```

Testing sul numero di output

```
load mathwork200.mat;
R = PageRank(G);
```

```
Error using PageRank (line 8)
Inserire come parametri di output R, OUT, IN
```

Testing sulla matrice G

Testo se è una matrice

```
G=rand(10,10,10);
[R, OUT, IN] = PageRank(G);
```

```
Error using PageRank (line 12)
Il primo input deve essere una matrice.
```

Testo se è sparsa o vuota

```
G=rand(100,100);
[R, OUT, IN] = PageRank(G);
```

```
Error using PageRank (line 14)
La matrice deve essere sparsa e non vuota.
```

```
G=[];
[R, OUT, IN] = PageRank(G);
```

```
Error using PageRank (line 14)
La matrice deve essere sparsa e non vuota.
```

Testo se è quadrata

```
G=sparse(rand(100,50));
[R, OUT, IN] = PageRank(G);
```

```
Error using PageRank (line 16)
La matrice deve essere quadrata.
```

Testo se è almeno di dimensione 2

```
G=sparse(rand(1,1));
[R, OUT, IN] = PageRank(G);
```

```
Error using PageRank (line 18)
La matrice deve essere almeno 2x2
```

Testo se è composta da elementi logical

```
G=sparse(rand(100,100));
[R, OUT, IN] = PageRank(G);
```

```
Error using PageRank (line 18)
Gli elementi della matrice devono essere logici.
```

Testing di Funzionamento

```
load mathwork200.mat;
[R, OUT, IN] = PageRank(G)
```

```
R = 200×1
   0.001526677743954
   0.004952923751719
   0.004291151787463
   0.004291151787463
   0.004291151787463
   0.004291151787463
   0.004291151787463
   0.004291151787463
   0.004291151787463
   0.004291151787463
   0.004291151787463
      ⋮
```

```
OUT =
   (1,1)       20
   (2,1)       20
   (3,1)       20
   (4,1)       21
   (5,1)       21
   (6,1)       20
```

(7,1)	20
(8,1)	20
(9,1)	20
(10,1)	20
(11,1)	20
(12,1)	20
(13,1)	20
(14,1)	20
(15,1)	20
(16,1)	3
(21,1)	19
(22,1)	19
(23,1)	19
(25,1)	20
(26,1)	13
(29,1)	19
(30,1)	19
(31,1)	19
(32,1)	19
(33,1)	19
(34,1)	19
(35,1)	19
(36,1)	19
(37,1)	19
(38,1)	19
(41,1)	123
(45,1)	12
(46,1)	1
(47,1)	12
(48,1)	12
(49,1)	13
(50,1)	13
(51,1)	12
(52,1)	12
(53,1)	13
(54,1)	1
(55,1)	13
(56,1)	1
(60,1)	21
(64,1)	5
(65,1)	19
(66,1)	4
(67,1)	4
(68,1)	4
(69,1)	4
(70,1)	21
(82,1)	21
(85,1)	15
(86,1)	14
(87,1)	19
(88,1)	16
(89,1)	2
(90,1)	1
(91,1)	2
(92,1)	4
(93,1)	2
(94,1)	1
(95,1)	15
(96,1)	19
(98,1)	29
(100,1)	12
(102,1)	12
(103,1)	4
(104,1)	6
(105,1)	6

```
(106,1)       12
(107,1)        4
(108,1)        5
(109,1)       14
(110,1)       14
(113,1)        1
(115,1)       29
(116,1)        3
(117,1)       16
(118,1)       22
(119,1)       12
(120,1)       14
(121,1)       16
(122,1)        3
(123,1)        3
(124,1)        3
(125,1)        3
(126,1)        6
(127,1)        4
(128,1)        5
(129,1)        7
(130,1)       22
(131,1)       12
(132,1)       14
(133,1)       25
(135,1)        3
(136,1)       15
(137,1)        4
(138,1)        3
(140,1)        3
(141,1)        1
(142,1)        2
(143,1)        5
(144,1)        5
(146,1)       25
(147,1)       29
(148,1)       17
(149,1)       18
(150,1)       18
(152,1)        4
(153,1)        3
(157,1)        3
(158,1)        5
(159,1)        4
(160,1)        3
(161,1)        3
(162,1)       10
(163,1)       29
(165,1)       21
(166,1)        5
(168,1)        7
(169,1)        7
(170,1)        3
(171,1)        3
(173,1)       21
(174,1)       32
(175,1)        5
(176,1)       13
(177,1)       15
(178,1)       12
(179,1)       12
(182,1)       12
(183,1)       14
(184,1)       14
(185,1)       13
```

```
 (186,1)       11
 (187,1)       11
 (188,1)        5
 (189,1)        6
 (190,1)        6
 (192,1)        7
 (193,1)       14
 (194,1)       12
 (195,1)       32
```

```
IN =
```

```
   (2,1)       19
   (3,1)       17
   (4,1)       17
   (5,1)       17
   (6,1)       17
   (7,1)       17
   (8,1)       17
   (9,1)       17
  (10,1)       17
  (11,1)       17
  (12,1)       17
  (13,1)       17
  (14,1)       17
  (15,1)       17
  (16,1)       91
  (17,1)       17
  (18,1)       36
  (19,1)       36
  (20,1)       46
  (21,1)        3
  (22,1)       11
  (23,1)        2
  (24,1)        2
  (25,1)        2
  (26,1)        5
  (27,1)       11
  (28,1)       10
  (29,1)       10
  (30,1)        2
  (31,1)        2
  (32,1)        2
  (33,1)        2
  (34,1)        2
  (35,1)        2
  (36,1)        2
  (37,1)        2
  (38,1)        2
  (39,1)        2
  (40,1)        4
  (41,1)       23
  (42,1)        1
  (43,1)       15
  (44,1)       15
  (45,1)       24
  (46,1)       16
  (47,1)       24
  (48,1)       24
  (49,1)       15
  (50,1)       24
  (51,1)       24
  (52,1)       24
  (53,1)       24
  (54,1)       17
  (55,1)       24
```

```
 (56,1)       17
 (57,1)        1
 (58,1)        1
 (59,1)        1
 (60,1)        1
 (61,1)        1
 (62,1)        1
 (63,1)        1
 (64,1)        1
 (65,1)        1
 (66,1)        1
 (67,1)        1
 (68,1)        1
 (69,1)        1
 (70,1)        1
 (71,1)        2
 (72,1)        1
 (73,1)        1
 (74,1)        1
 (75,1)        1
 (76,1)        1
 (77,1)        1
 (78,1)        1
 (79,1)        1
 (80,1)        1
 (81,1)       20
 (82,1)       21
 (83,1)        1
 (84,1)        1
 (85,1)        2
 (86,1)       22
 (87,1)        7
 (88,1)       10
 (89,1)        8
 (90,1)        6
 (91,1)        5
 (92,1)        4
 (93,1)        7
 (94,1)        6
 (95,1)       49
 (96,1)        2
 (97,1)        3
 (98,1)        8
 (99,1)        3
(100,1)        5
(101,1)        5
(102,1)        9
(103,1)        5
(104,1)       12
(105,1)        7
(106,1)        4
(107,1)        9
(108,1)        5
(109,1)        4
(110,1)        4
(111,1)        3
(112,1)        3
(113,1)        4
(114,1)        6
(115,1)        2
(116,1)       14
(117,1)        2
(118,1)        8
(119,1)        4
(120,1)       11
```

```
(121,1)       11
(122,1)        5
(123,1)        5
(124,1)        4
(125,1)        4
(126,1)        6
(127,1)        6
(128,1)        6
(129,1)        6
(130,1)        2
(131,1)        3
(132,1)        2
(133,1)        8
(134,1)        3
(135,1)        5
(136,1)       32
(137,1)        6
(138,1)        3
(139,1)        7
(140,1)       40
(141,1)        7
(142,1)        5
(143,1)       16
(144,1)       16
(145,1)        3
(146,1)        2
(147,1)       11
(148,1)        4
(149,1)        9
(150,1)        7
(151,1)        3
(152,1)       14
(153,1)       14
(154,1)        3
(155,1)        3
(156,1)       10
(157,1)       18
(158,1)        5
(159,1)        4
(160,1)        4
(161,1)        4
(162,1)        8
(163,1)        2
(164,1)        3
(165,1)       12
(166,1)       12
(167,1)        3
(168,1)        7
(169,1)        6
(170,1)        4
(171,1)        5
(172,1)        3
(173,1)        2
(174,1)       10
(175,1)        8
(176,1)       28
(177,1)       44
(178,1)        7
(179,1)        6
(180,1)        3
(181,1)        3
(182,1)        4
(183,1)        8
(184,1)        7
(185,1)        6
```

```
 (186,1)       18
 (187,1)       34
 (188,1)       10
 (189,1)       10
 (190,1)        4
 (191,1)        3
 (192,1)        5
 (193,1)        4
 (194,1)        8
 (195,1)        2
 (196,1)       20
 (197,1)        1
 (198,1)       20
 (199,1)       20
 (200,1)       20
```

```
load repubblica.mat;
[R, OUT, IN] = PageRank(G)
```

```
R = 100×1
   0.003310330436957
   0.009119322719054
   0.009884764682581
   0.012046067683317
   0.009978193592158
   0.010442059932598
   0.019281967796491
   0.010442059932598
   0.010442059932598
   0.078575023400042
      ⋮
```

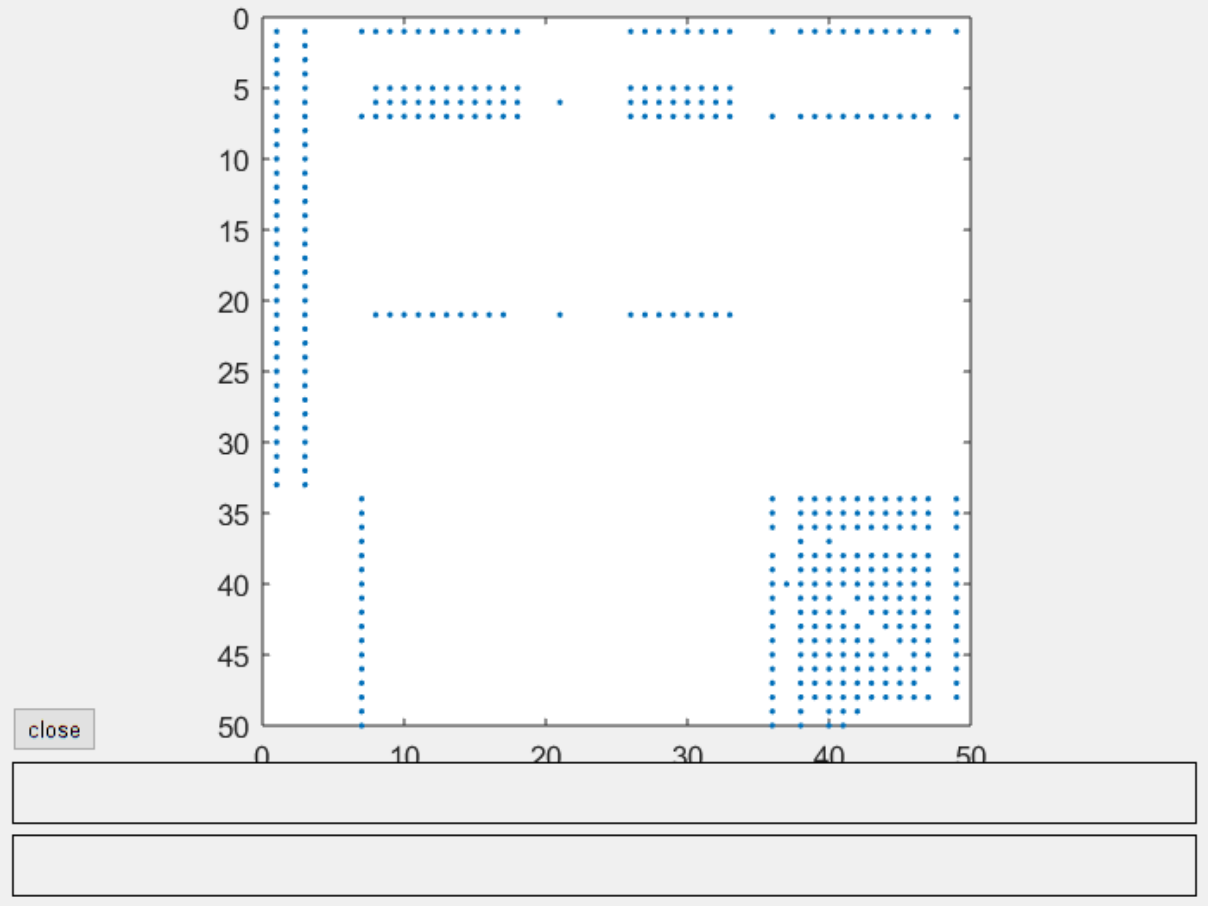
```
OUT =
   (1,1)       99
  (10,1)       99
  (13,1)        1
  (15,1)        6
  (16,1)        6
  (22,1)       34
  (23,1)       32
  (24,1)       33
  (25,1)       32
  (26,1)       33
  (27,1)       32
  (28,1)       32
  (29,1)       32
  (30,1)       32
  (31,1)       33
  (32,1)        1
  (33,1)       16
  (35,1)       59
  (36,1)       16
  (37,1)       17
  (38,1)       11
  (39,1)        8
  (40,1)       23
  (41,1)       15
  (42,1)       55
  (43,1)       17
  (44,1)        4
  (45,1)       55
```

```
  (46,1)       55
  (47,1)       55
  (48,1)       30
  (49,1)        6
  (50,1)       22
  (51,1)       38
  (52,1)       25
  (53,1)       55
  (54,1)       55
  (55,1)       15
  (56,1)        4
  (57,1)       15
  (58,1)        8
  (59,1)       20
  (60,1)        5
  (61,1)        9
  (62,1)        8
  (63,1)        2
  (65,1)        2
  (66,1)        2
  (67,1)       38
  (69,1)       24
  (71,1)        4
  (72,1)        8
  (74,1)       44
  (75,1)       44
  (76,1)       59
  (77,1)       56
  (78,1)       43
  (79,1)       57
  (81,1)       57
  (82,1)       60
  (83,1)       59
  (84,1)       59
  (85,1)        7
  (87,1)       60
  (88,1)       62
  (91,1)       10
  (92,1)        9
  (93,1)       59
  (94,1)        7
  (95,1)        8
  (96,1)        9
  (97,1)       10
  (98,1)        5
  (99,1)        7

IN =

   (2,1)       34
   (3,1)       37
   (4,1)       40
   (5,1)       37
   (6,1)       38
   (7,1)       39
   (8,1)       38
   (9,1)       38
  (10,1)       71
  (11,1)       33
  (12,1)       13
  (13,1)       50
  (14,1)       34
  (15,1)       44
  (16,1)        3
  (17,1)       12
  (18,1)        4
```

```
(19,1)        2
(20,1)       47
(21,1)        7
(22,1)       13
(23,1)       12
(24,1)       12
(25,1)       12
(26,1)       13
(27,1)       13
(28,1)       13
(29,1)       12
(30,1)       13
(31,1)       12
(32,1)       41
(33,1)       53
(34,1)        2
(35,1)       30
(36,1)       31
(37,1)       31
(38,1)       30
(39,1)       24
(40,1)       27
(41,1)       32
(42,1)       26
(43,1)       23
(44,1)       60
(45,1)       26
(46,1)       29
(47,1)       26
(48,1)       26
(49,1)       26
(50,1)       27
(51,1)       25
(52,1)       30
(53,1)       26
(54,1)       26
(55,1)       30
(56,1)       27
(57,1)       24
(58,1)       24
(59,1)       25
(60,1)       27
(61,1)       24
(62,1)       40
(63,1)       26
(64,1)       22
(65,1)       54
(66,1)       47
(67,1)       46
(68,1)       25
(69,1)       24
(70,1)       22
(71,1)       64
(72,1)       25
(73,1)        2
(74,1)        5
(75,1)        3
(76,1)        6
(77,1)        2
(78,1)        2
(79,1)       11
(80,1)        2
(81,1)        3
(82,1)       13
(83,1)       12
```

```
  (84,1)        8
  (85,1)        2
  (86,1)        2
  (87,1)        4
  (88,1)        4
  (89,1)       11
  (90,1)        2
  (91,1)        4
  (92,1)        6
  (93,1)        4
  (94,1)        2
  (95,1)        2
  (96,1)        7
  (97,1)        3
  (98,1)        3
  (99,1)        3
 (100,1)        2
```

```
[U,G]=surfer('http://www.unina.it',50);
```




```
[R, OUT, IN] = PageRank(G)
```

```
R = 50×1
   0.060476030042693
   0.009671544519183
   0.009671544519183
   0.009671544519183
   0.041321673989646
   0.070344717905559
```

```
   0.060476030042693
   0.009671544519183
   0.009671544519183
   0.009671544519183
     ⋮
```

```
OUT =
   (1,1)       33
   (3,1)       33
   (7,1)       19
   (8,1)        5
   (9,1)        5
  (10,1)        5
  (11,1)        5
  (12,1)        5
  (13,1)        5
  (14,1)        5
  (15,1)        5
  (16,1)        5
  (17,1)        5
  (18,1)        4
  (21,1)        2
  (26,1)        5
  (27,1)        5
  (28,1)        5
  (29,1)        5
  (30,1)        5
  (31,1)        5
  (32,1)        5
  (33,1)        5
  (36,1)       18
  (37,1)        1
  (38,1)       19
  (39,1)       16
  (40,1)       19
  (41,1)       17
  (42,1)       16
  (43,1)       15
  (44,1)       15
  (45,1)       15
  (46,1)       16
  (47,1)       15
  (49,1)       16
```

```
IN =
   (1,1)       34
   (2,1)        2
   (3,1)        2
   (4,1)        2
   (5,1)       21
   (6,1)       22
   (7,1)       34
   (8,1)        2
   (9,1)        2
  (10,1)        2
  (11,1)        2
  (12,1)        2
  (13,1)        2
  (14,1)        2
  (15,1)        2
  (16,1)        2
  (17,1)        2
  (18,1)        2
  (19,1)        2
  (20,1)        2
```

```
  (21,1)       21
  (22,1)        2
  (23,1)        2
  (24,1)        2
  (25,1)        2
  (26,1)        2
  (27,1)        2
  (28,1)        2
  (29,1)        2
  (30,1)        2
  (31,1)        2
  (32,1)        2
  (33,1)        2
  (34,1)       13
  (35,1)       13
  (36,1)       13
  (37,1)        3
  (38,1)       13
  (39,1)       13
  (40,1)       14
  (41,1)       12
  (42,1)       12
  (43,1)       12
  (44,1)       12
  (45,1)       12
  (46,1)       13
  (47,1)       12
  (48,1)       13
  (49,1)        6
  (50,1)        5
```

Testing di Accuratezza

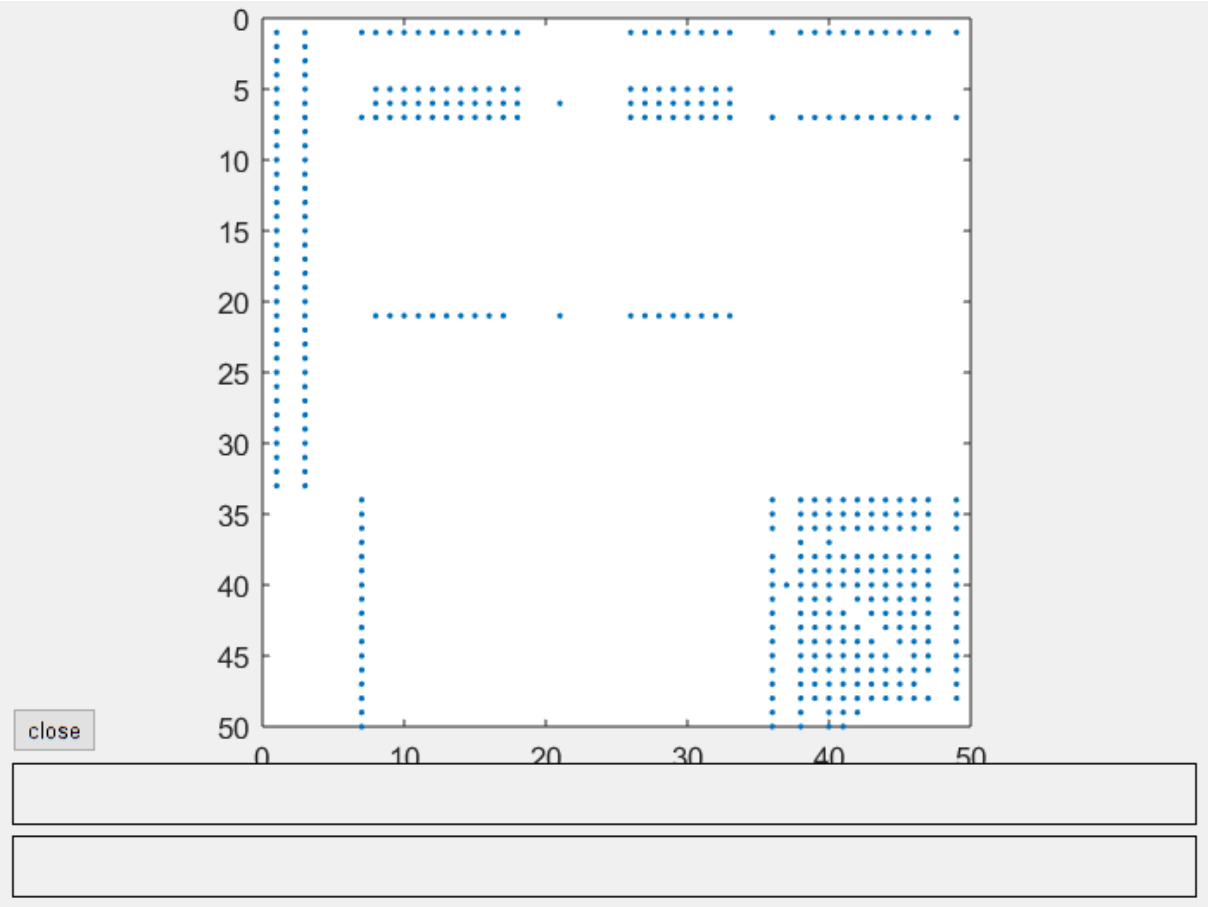
```
load mathwork200.mat;
H=digraph(G','omitselfloops');
[R, OUT, IN] = PageRank(G);
pg_ranks=centrality(H,'pagerank','MaxIterations',200,'FollowProbability',0.85,'Tolerance',10^-7
err=norm(R-pg_ranks)/norm(pg_ranks)
```

```
err =
     2.411817257931451e-06
```

```
load repubblica.mat;
H=digraph(G','omitselfloops');
[R, OUT, IN] = PageRank(G);
pg_ranks=centrality(H,'pagerank','MaxIterations',200,'FollowProbability',0.85,'Tolerance',10^-7
err=norm(R-pg_ranks)/norm(pg_ranks)
```

```
err =
     1.478002715325517e-07
```

```
[U,G]=surfer('http://www.unina.it',50);
```




```
H=digraph(G','omitselfloops');
[R, OUT, IN] = PageRank(G);
pg_ranks=centrality(H,'pagerank','MaxIterations',200,'FollowProbability',0.85,'Tolerance',10^-
err=norm(R-pg_ranks)/norm(pg_ranks)
```

```
err =
     5.864905738502280e-07
```