Graphs Connecting Pairs that Sum to Squares

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Characteristic Polynomials of A:

The reason the characteristic polynomials were generated is that they provide a lot of information about the graphs from the adjacency matrix. For example since the constant of the polynomial (corresponds to $\det(A)$) for most of the graphs is equal to 0, then most of the adjacency matrices are equal to 0 and at least one eigenvalue must be 0 too.

x^2

$-x^3 + x$

$x^4 - x^2$

$-x^5 + 2x^3 - x$

$x^6 - 3x^4 + 2x^2$

$-x^7 + 4x^5 - 5x^3 + 2x$

$x^8 - 5x^6 + 8x^4 - 5x^2 + 1$

$-x^9 + 6x^7 - 12x^5 + 9x^3 - 2x$

$x^{10} - 7x^8 + 17x^6 - 17x^4 + 6x^2$

$-x^{11} + 8x^9 - 23x^7 + 28x^5 - 12x^3$

$x^{12} - 9x^{10} + 30x^8 - 45x^6 + 29x^4 - 6x^2$

$-x^{13} + 11x^{11} - 45x^9 + 86x^7 - 78x^5 + 29x^3 - 2x$

$x^{14} - 13x^{12} + 65x^{10} - 158x^8 + 195x^6 - 116x^4 + 27x^2 - 1$

$-x^{15} + 15x^{13} - 88x^{11} + 2x^{10} + 257x^9 - 16x^8 - 392x^7 + 42x^6 + 297x^5 - 40x^4 - 94x^3 + 10x^2 + 8x$

$x^{16} - 16x^{14} + 102x^{12} - 2x^{11} - 332x^{10} + 18x^9 + 586x^8 - 56x^7 - 547x^6 + 70x^5 + 241x^4 - 30x^3 - 38x^2 + 2x + 1$

$-x^{17} + 17x^{15} - 117x^{13} + 2x^{12} + 421x^{11} - 20x^{10} - 852x^9 + 74x^8 + 968x^7 - 126x^6 - 578x^5 + 100x^4 + 153x^3 - 32x^2 - 11x + 2$

$x^{18} - 18x^{16} + 132x^{14} - 2x^{13} - 510x^{12} + 22x^{11} + 1122x^{10} - 90x^9 - 1419x^8 + 172x^7 + 992x^6 - 160x^5 - 347x^4 + 68x^3 + 48x^2 - 10x - 1$

$-x^{19} + 20x^{17} - 165x^{15} + 2x^{14} + 731x^{13} - 22x^{12} - 1895x^{11} + 88x^{10} + 2935x^9 - 154x^8 - 2660x^7 + 106x^6 + 1325x^5 - 6x^4 - 319x^3 - 14x^2 + 27x + 2$

$x^{20} - 22x^{18} + 202x^{16} - 2x^{15} - 1009x^{14} + 26x^{13} + 2994x^{12} - 126x^{11} - 5399x^{10} + 280x^9 + 5791x^8 - 270x^7 - 3440x^6 + 56x^5 + 970x^4 + 44x^3 - 92x^2 - 8x$

$-x^{21} + 24x^{19} - 242x^{17} + 2x^{16} + 1339x^{15} - 26x^{14} - 4452x^{13} + 122x^{12} + 9142x^{11} - 236x^{10} - 11435x^9 + 94x^8 + 8209x^7 + 256x^6 - 2942x^5 - 268x^4 + 370x^3 + 40x^2 - 4x$

$x^{22} - 26x^{20} + 285x^{18} - 2x^{17} - 1723x^{16} + 28x^{15} + 6302x^{14} - 144x^{13} - 14367x^{12} + 312x^{11} + 20226x^{10} - 152x^9 - 16745x^8 - 408x^7 + 7314x^6 + 526x^5 - 1344x^4 - 130x^3 + 67x^2 + 8x$

$-x^{23} + 28x^{21} - 333x^{19} + 2x^{18} + 2207x^{17} - 32x^{16} - 8980x^{15} + 196x^{14} + 23269x^{13} - 560x^{12} - 38498x^{11} + 658x^{10} + 39616x^9 + 114x^8 - 23850x^7 - 890x^6 + 7454x^5 + 600x^4 - 933x^3 - 110x^2 + 17x + 2$

$x^{24} - 30x^{22} + 384x^{20} - 4x^{19} - 2758x^{18} + 72x^{17} + 12283x^{16} - 530x^{15} - 35343x^{14} + 2064x^{13} + 66326x^{12} - 4600x^{11} - 79966x^{10} + 5940x^9 + 59424x^8 - 4298x^7 - 25142x^6 + 1564x^5 + 5213x^4 - 176x^3 - 369x^2 - 24x + 1$

$-x^{25} + 32x^{23} - 440x^{21} + 4x^{20} + 3425x^{19} - 76x^{18} - 16718x^{17} + 594x^{16} + 53482x^{15} - 2460x^{14} - 113676x^{13} + 5774x^{12} + 159112x^{11} - 7538x^{10} - 142058x^9 + 4798x^8 + 75964x^7 - 754x^6 - 21620x^5 - 400x^4 + 2525x^3 + 92x^2 - 43x - 2$

$x^{26} - 34x^{24} + 500x^{22} - 4x^{21} - 4195x^{20} + 80x^{19} + 22275x^{18} - 662x^{17} - 78394x^{16} + 2926x^{15} + 185886x^{14} - 7408x^{13} - 295380x^{12} + 10560x^{11} + 305982x^{10} - 7366x^9 - 194894x^8 + 1040x^7 + 68136x^6 + 1006x^5 - 10315x^4 - 110x^3 + 388x^2 + 2x - 4$

$-x^{27} + 36x^{25} - 564x^{23} + 4x^{22} + 5077x^{21} - 88x^{20} - 29173x^{19} + 812x^{18} + 112307x^{17} - 4078x^{16} - 295422x^{15} + 12052x^{14} + 530966x^{13} - 20924x^{12} - 640167x^{11} + 19330x^{10} + 497046x^9 - 5572x^8 - 230393x^7 - 4270x^6 + 55152x^5 + 3022x^4 - 4908x^3 - 360x^2 + 92x + 8$

$$x^{28}-38x^{26}+632x^{24}-6x^{23}-6077x^{22}+150x^{21}+37554x^{20}-1604x^{19}-156664x^{18}+9606x^{17}+450477x^{16}-35408x^{15}-894282x^{14}+83054x^{13}+1206662x^{12}-123694x^{11}-1067810x^{10}+113152x^{9}+580975x^{8}-59366x^{7}-173385x^{6}+15952x^{5}+22843x^{4}-1762x^{3}-876x^{2}-10x+4$$

$$-x^{29}+40x^{27}-703x^{25}+8x^{24}+7171x^{23}-222x^{22}-47210x^{21}+2642x^{20}+210836x^{19}-17700x^{18}-652809x^{17}+73586x^{16}+1405750x^{15}-197112x^{14}-2077226x^{13}+341596x^{12}+2039283x^{11}-374170x^{10}-1253764x^{9}+245468x^{8}+434938x^{7}-87724x^{6}-70352x^{5}+14480x^{4}+3858x^{3}-572x^{2}-75x$$

$$x^{30}-42x^{28}-2x^{27}+778x^{26}+64x^{25}-8399x^{24}-892x^{23}+58801x^{22}+7130x^{21}-280912x^{20}-36194x^{19}+937635x^{18}+121926x^{17}-2199498x^{16}-276164x^{15}+3593314x^{14}+416002x^{13}-3986673x^{12}-400866x^{11}+2867708x^{10}+226566x^{9}-1236905x^{8}-60702x^{7}+281998x^{6}+2636x^{5}-28782x^{4}+432x^{3}+936x^{2}$$

$$-x^{31}+44x^{29}+2x^{28}-858x^{27}-68x^{26}+9808x^{25}+1016x^{24}-73244x^{23}-8812x^{22}+376793x^{21}+49332x^{20}-1371278x^{19}-187334x^{18}+3566577x^{17}+492968x^{16}-6610858x^{15}-900584x^{14}+8595970x^{13}+1122906x^{12}-7595396x^{11}-916154x^{10}+4314292x^{9}+448306x^{8}-1431091x^{7}-108010x^{6}+233457x^{5}+6304x^{4}-13994x^{3}+264x^{2}+36x$$

$$x^{32}-46x^{30}-2x^{29}+941x^{28}+72x^{27}-11330x^{26}-1148x^{25}+89546x^{24}+10722x^{23}-490375x^{22}-65324x^{21}+1913687x^{20}+273332x^{19}-5388050x^{18}-804324x^{17}+10950304x^{16}+1673462x^{15}-15895540x^{14}-2435626x^{13}+16102964x^{12}+2408838x^{11}-10931270x^{10}-1530018x^{9}+4640296x^{8}+559038x^{7}-1086977x^{6}-90268x^{5}+107537x^{4}+1212x^{3}-1856x^{2}-72x$$

$$-x^{33}+49x^{31}+2x^{30}-1071x^{29}-76x^{28}+13831x^{27}+1286x^{26}-117788x^{25}-12824x^{24}+698881x^{23}+84008x^{22}-2974551x^{21}-381158x^{20}+9207529x^{19}+1229086x^{18}-20782906x^{17}-2840758x^{16}+33960724x^{15}+4679590x^{14}-39473170x^{13}-5384512x^{12}+31652811x^{11}+4162990x^{10}-16673244x^{9}-2018538x^{8}+5329910x^{7}+536378x^{6}-900454x^{5}-53674x^{4}+59756x^{3}-1542x^{2}-428x-8$$

$$x^{34}-52x^{32}-2x^{31}+1210x^{30}+78x^{29}-16699x^{28}-1354x^{27}+152667x^{26}+13846x^{25}-977708x^{24}-93054x^{23}+4521069x^{22}+434328x^{21}-15327779x^{20}-1451424x^{19}+38276102x^{18}+3531126x^{17}-70085516x^{16}-6302294x^{15}+92802786x^{14}+8250566x^{13}-86654323x^{12}-7838874x^{11}+54763383x^{10}+5245774x^{9}-21914669x^{8}-2309612x^{7}+4950252x^{6}+577360x^{5}-501588x^{4}-57152x^{3}+11676x^{2}+416x-20$$

Characteristic Polynomials of A^n:

x^2

$-x^3 + x$

$x^4 - 2x^3 + x^2$

$-x^5 + 2x^3 - x$

$x^6 - 18x^5 + 97x^4 - 144x^3 + 64x^2$

$-x^7 + 130x^5 - 257x^3 + 128x$

$x^8 - 98x^7 + 2593x^6 - 9506x^5 + 14020x^4 - 9506x^3 + 2593x^2 - 98x + 1$

$-x^9 + 6291x^7 - 2964627x^5 + 2958849x^3 - 512x$

(Further polynomials were omitted due to simplification issues)