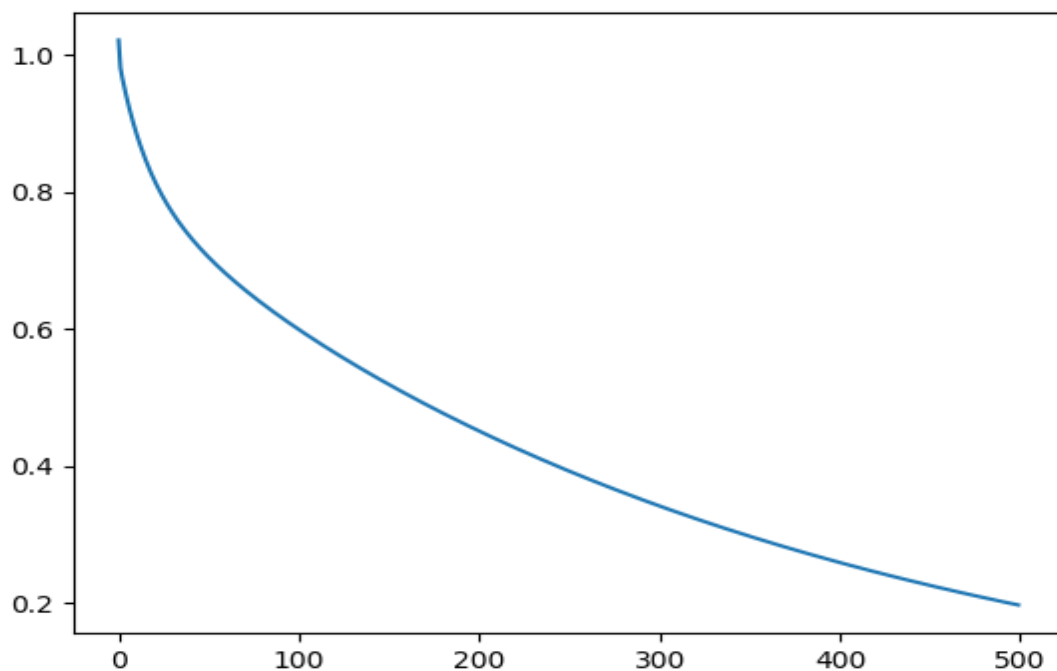


### Julia Code:

```
using LinearAlgebra
b = rand(20,1)
A = rand(20,10)
xValues=inv(A'A)*(A'b)
result=1/((norm(A))^2)
x=Array{Array{Float64}}(undef,500)
x0=[0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0]'
x[1]=x0
for i=2:500
    x[i]=x[i-1]-(result*A'*((A*x[i-1])-b))
end
x
y=Float64[]
for i=1:500
    push!(y,norm(x[i]-xValues))
end
using PyPlot
plot(y)
```

### Output Graph:



## Code Run :

Last login: Thu Oct 31 20:37:26 on ttys000

The default interactive shell is now zsh.

To update your account to use zsh, please run `chsh -s /bin/zsh`.

For more details, please visit <https://support.apple.com/kb/HT208050>.

Vikass-MacBook-Pro:~ vikas\$ exec '/Applications/Julia-1.2.app/Contents/Resources/julia/bin/julia'



Documentation: <https://docs.julialang.org>

Type "?" for help, "]"? for Pkg help.

Version 1.2.0 (2019-08-20)

Official <https://julialang.org/> release

**julia>** using LinearAlgebra

**julia>** b = rand(20,1)  
20×1 Array{Float64,2}:

```
0.5271129933491041
0.5271999094296111
0.29962019232331283
0.6069076179057133
0.9127255376576648
0.7158824806021968
0.14868808549806567
0.3910086832112398
0.8734601309654371
0.45952295897415296
0.5679791460081112
0.0388738525284571
0.22132298077064316
0.6204093031055595
0.5077743101605499
0.8020649878556914
0.6324230721831432
0.8652688046259438
0.14539039645081742
0.8647496483968293
```

**julia>** A = rand(20,10)  
20×10 Array{Float64,2}:

```
0.582858  0.926417  0.943641  ...  0.589049  0.260598  0.604033
0.934517  0.743156  0.845392  ...  0.128589  0.407803  0.160443
```

```
#undef
#undef
#undef
#undef
#undef
#undef
#undef
#undef
#undef
:
#undef
#undef
```

```
#undef
#undef
#undef
#undef
#undef
#undef
#undef
```

```
julia> x0=[0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0]'
10×1 Adjoint{Float64,Array{Float64,2}}:
```

```
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
```

```
julia> x[1]=x0
10×1 Adjoint{Float64,Array{Float64,2}}:
```

```
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
```

```
julia> for i=2:500
           x[i]=x[i-1]-(mu*A')*((A*x[i-1])-b)
       end
```

```
julia> x
500-element Array{Array{Float64,N} where N,1}:
 [0.0; 0.0; ... ; 0.0; 0.0]
 [0.0941913727760768; 0.0843262320476722; ... ; 0.07918750308437873;
 0.09759113446473186]
 [0.12225456028273543; 0.10603793696007728; ... ; 0.09802895524222144;
 0.11863442603924745]
 [0.13542520627778354; 0.11383524645906001; ... ; 0.10344232953141896;
 0.12272276503828064]
 [0.14506662865278527; 0.11851024149724533; ... ; 0.1058281166344291;
 0.12306176623166254]
```

```
[0.1537060049230137; 0.12245459673952921; ... ; 0.10749433029799407;
0.12257760667964572]
[0.1619120218211862; 0.1261984829718631; ... ; 0.10895550879907734;
0.12191853646828614]
[0.1698189834585533; 0.12985958790352853; ... ; 0.11032858523751347;
0.12122801688836655]
[0.177464571846054; 0.1334642174657277; ... ; 0.11164222168089516;
0.1205376489037627]
[0.18486471150743247; 0.1370184498698249; ... ; 0.11290536605789331;
0.1198542465973586]
:
[0.4843112021226414; 0.4047059547598087; ... ; 0.33997040775660636; -
0.02865130767163871]
[0.4843456407959134; 0.4047473346000376; ... ; 0.34012469573306425; -
0.028785779564642313]
[0.48437998097622426; 0.40478852808081683; ... ; 0.34027835442633414; -
0.02891978373214551]
[0.4844142228616777; 0.40482953632263763; ... ; 0.3404313867885968; -
0.029053321682048227]
[0.4844483666495036; 0.4048703604361546; ... ; 0.34058379575539444; -
0.029186394918654324]
[0.4844824125360923; 0.40491100152230125; ... ; 0.3407355842457355; -
0.029319004942665233]
[0.48451636071702775; 0.4049514606724034; ... ; 0.34088675516219863; -
0.029451153251173985]
[0.4845502113871196; 0.4049917389682916; ... ; 0.34103731139103627; -
0.029582841337659264]
[0.4845839647404348; 0.4050318374824114; ... ; 0.34118725580227777; -
0.0297140706919799]
```

```
julia> y=Float64[]
0-element Array{Float64,1}
```

```
julia> for i=1:500
           push!(y,norm(x[i]-xhat))
       end
```

```
julia> using PyPlot
ERROR: ArgumentError: Package PyPlot not found in current path:
- Run `import Pkg; Pkg.add("PyPlot")` to install the PyPlot package.
```

```
Stacktrace:
 [1] require(::Module, ::Symbol) at ./loading.jl:876
```

```
julia> plot(y)
ERROR: UndefVarError: plot not defined
Stacktrace:
 [1] top-level scope at REPL[14]:1
```

```
julia> Pkg.add("PyPlot")
```

**ERROR: UndefVarError: Pkg not defined**

Stacktrace:

[1] top-level scope at **REPL[15]:1**

```
julia> import Pkg; Pkg.add("PyPlot")
  Cloning default registries into `~/.julia`
  Cloning registry from
"https://github.com/JuliaRegistries/General.git"
  Added registry `General` to `~/.julia/registries/General`
  Resolving package versions...
  Installed LaTeXStrings — v1.0.3
  Installed VersionParsing — v1.1.3
  Installed Tokenize — v0.5.6
  Installed FixedPointNumbers — v0.6.1
  Installed PyPlot — v2.8.2
  Installed DataStructures — v0.17.5
  Installed PyCall — v1.91.2
  Installed Colors — v0.9.6
  Installed Reexport — v0.2.0
  Installed MacroTools — v0.5.1
  Installed Compat — v2.2.0
  Installed CSTParser — v1.0.0
  Installed Parsers — v0.3.7
  Installed ColorTypes — v0.8.0
  Installed OrderedCollections — v1.1.0
  Installed JSON — v0.21.0
  Installed Conda — v1.3.0
  Updating `~/.julia/environments/v1.2/Project.toml`
[d330b81b] + PyPlot v2.8.2
  Updating `~/.julia/environments/v1.2/Manifest.toml`
[00ebfdb7] + CSTParser v1.0.0
[3da002f7] + ColorTypes v0.8.0
[5ae59095] + Colors v0.9.6
[34da2185] + Compat v2.2.0
[8f4d0f93] + Conda v1.3.0
[864edb3b] + DataStructures v0.17.5
[53c48c17] + FixedPointNumbers v0.6.1
[682c06a0] + JSON v0.21.0
[b964fa9f] + LaTeXStrings v1.0.3
[1914dd2f] + MacroTools v0.5.1
[bac558e1] + OrderedCollections v1.1.0
[69de0a69] + Parsers v0.3.7
[438e738f] + PyCall v1.91.2
[d330b81b] + PyPlot v2.8.2
[189a3867] + Reexport v0.2.0
[0796e94c] + Tokenize v0.5.6
[81def892] + VersionParsing v1.1.3
[2a0f44e3] + Base64
[ade2ca70] + Dates
[8bb1440f] + DelimitedFiles
```

```
[8ba89e20] + Distributed
[b77e0a4c] + InteractiveUtils
[76f85450] + LibGit2
[8f399da3] + Libdl
[37e2e46d] + LinearAlgebra
[56ddb016] + Logging
[d6f4376e] + Markdown
[a63ad114] + Mmap
[44cfe95a] + Pkg
[de0858da] + Printf
[3fa0cd96] + REPL
[9a3f8284] + Random
[ea8e919c] + SHA
[9e88b42a] + Serialization
[1a1011a3] + SharedArrays
[6462fe0b] + Sockets
[2f01184e] + SparseArrays
[10745b16] + Statistics
[8dfed614] + Test
[cf7118a7] + UUIDs
[4ec0a83e] + Unicode
```

```
Building Conda → `~/.julia/packages/Conda/kLXeC/deps/build.log`
```

```
Building PyCall → `~/.julia/packages/PyCall/tt0NZ/deps/build.log`
```

```
julia> using LinearAlgebra
```

```
julia> b = rand(20,1)
20×1 Array{Float64,2}:
 0.03853349146799134
 0.47779054223394457
 0.012209981373887624
 0.9613685353937402
 0.5358211280006246
 0.11284144760386283
 0.4654514795655338
 0.2124256655215535
 0.668644691536104
 0.5329630312109768
 0.08224538515514901
 0.17244709711387252
 0.4573604559930704
 0.7456042148597575
 0.5778562128770592
 0.7800859028864451
 0.035427979546535315
 0.4223967219910274
 0.5665710175339471
 0.2726279630194006
```

```
julia> A = rand(20,10)
```

20×10 Array{Float64,2}:

0.880845	0.226071	0.222605	0.637596	0.275959	0.264119
0.566478	0.57869	0.989248	0.918671		
0.599349	0.230739	0.38313	0.300698	0.265735	0.0854409
0.748242	0.393327	0.513193	0.808471		
0.409318	0.157671	0.291907	0.591362	0.838746	0.711017
0.994966	0.6178	0.237099	0.979112		
0.441552	0.972571	0.615765	0.892351	0.972015	0.052309
0.187999	0.475843	0.521522	0.693669		
0.0792519	0.549877	0.257989	0.778299	0.58207	0.851512
0.81499	0.86885	0.766897	0.924852		
0.558027	0.343966	0.729283	0.413085	0.545133	0.513374
0.971048	0.108215	0.313243	0.470115		
0.620876	0.480081	0.154275	0.709706	0.0351437	0.997347
0.959786	0.368662	0.640957	0.524227		
0.326879	0.0596107	0.696675	0.0942191	0.0761181	0.933231
0.278815	0.177021	0.933549	0.990981		
0.987679	0.0335558	0.888047	0.0988343	0.136168	0.688825
0.812429	0.617882	0.779468	0.828941		
0.353147	0.171833	0.515487	0.487596	0.727468	0.482322
0.132482	0.040031	0.404638	0.433247		
0.104506	0.149977	0.308645	0.996115	0.94655	0.617215
0.0612762	0.540244	0.939306	0.146703		
0.0573564	0.621468	0.806792	0.701663	0.593327	0.839338
0.711354	0.151047	0.800242	0.746221		
0.3783	0.0201576	0.0164768	0.522631	0.517842	0.445396
0.643956	0.411313	0.977892	0.355566		
0.879202	0.69774	0.308595	0.729556	0.573761	0.766012
0.382933	0.38244	0.548944	0.112438		
0.0767805	0.654866	0.631315	0.488214	0.411252	0.855176
0.00514037	0.629363	0.345607	0.191922		
0.759005	0.831064	0.64033	0.449657	0.0694626	0.15536
0.101321	0.286165	0.0765931	0.0430858		
0.535112	0.265542	0.376356	0.892564	0.181578	0.865876
0.735972	0.845846	0.721908	0.148724		
0.543631	0.341957	0.0600595	0.882809	0.867987	0.0726634
0.537091	0.176504	0.344113	0.810639		
0.110409	0.0178684	0.905794	0.915908	0.864121	0.0335617
0.525776	0.315258	0.4696	0.200185		
0.316525	0.797838	0.797312	0.691641	0.0466362	0.456248
0.667941	0.764165	0.209065	0.593317		

julia> xValues=inv(A'A)\*(A'b)

10×1 Array{Float64,2}:

0.3356363174450051
0.6038525467236626
0.16924703542549668
-0.44594933399699244
0.43687205504846816
-0.15418071813357548



$-0.0474187181131106$   
 $0.1428313690972528$   
 $0.25868399104818374$   
 $-0.18683523543583352$

```
julia> result=1/((norm(A))^2)
0.014654398825295194
```

```
julia> x=Array{Array{Float64}}(undef,500)
500-element Array{Array{Float64,N} where N,1}:
```

[illegible]

[illegible]

```
julia> x0=[0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0]'  
10×1 Adjoint{Float64,Array{Float64,2}}:  
 0.0  
 0.0  
 0.0  
 0.0  
 0.0  
 0.0  
 0.0  
 0.0  
 0.0  
 0.0
```

```
julia> x[1]=x0
10x1 Adjoint{Float64,Array{Float64,2}}:
 0.0
 0.0
```

```
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
```

```
julia> for i=2:500
          x[i]=x[i-1]-(result*A')*((A*x[i-1])-b)
        end
```

```
julia> x
500-element Array{Array{Float64,N} where N,1}:
 [0.0; 0.0; ... ; 0.0; 0.0]
 [0.05778537401318615; 0.05563737707997276; ... ; 0.06290527029676447;
 0.05925311581280011]
 [0.07616131622030504; 0.077285212445416; ... ; 0.0740850500769752;
 0.06873077091903798]
 [0.08567860672118455; 0.09099289413889675; ... ; 0.07397313080463068;
 0.06735825457725202]
 [0.09311842619077892; 0.10256048568478006; ... ; 0.07153387088377484;
 0.06376375727185948]
 [0.0999865721985492; 0.11329293104292916; ... ; 0.06874764728170449;
 0.059851819247551286]
 [0.10661812845183516; 0.1234966531555833; ... ; 0.06604523474938574;
 0.05603528524939625]
 [0.11308845935421499; 0.1332556462540331; ... ; 0.0635139123115768;
 0.05239647407662225]
 [0.11941538809481947; 0.1426037655496766; ... ; 0.06116513050486083;
 0.0489448630051983]
 [0.12560405793154003; 0.15156300439232132; ... ; 0.058993898571696055;
 0.04567425066871104]
 [0.1316568787316997; 0.16015202616135726; ... ; 0.056991946114880405;
 0.04257541695305088]
 [0.13757572513911806; 0.16838809250193582; ... ; 0.05515062620927862;
 0.0396389072200677]
 [0.14336241573526495; 0.1762875241492848; ... ; 0.053461542586794274;
 0.03685562610580591]
 [0.14901881133161426; 0.1838658343928953; ... ; 0.05191667254372569;
 0.03421694650916464]
 [0.15454682934198533; 0.1911377882960946; ... ; 0.05050837873433465;
 0.03171471224748785]
 [0.15994844010066034; 0.1981174439315363; ... ; 0.0492293970699803;
 0.029341218308986904]
 [0.16522565970703884; 0.2048181881978976; ... ; 0.04807282004272842;
 0.027089187262969303]
 [0.17038054259752042; 0.21125277008097923; ... ; 0.047032079724266936;
 0.024951745884335887]
```

[0.1754151745217673; 0.21743333206511853; ... ; 0.04610093134860621;  
0.0229224028331482]  
[0.18033166604248307; 0.22337143991827937; ... ; 0.04527343764704341;  
0.020995027519701788]  
[0.1851321465559389; 0.22907811096353997; ... ; 0.04454395394135207;  
0.019163830131024264]  
[0.18981875880525073; 0.23456384092178836; ... ; 0.04390711396671686;  
0.01742334276339069]  
[0.1943936538545284; 0.23983862940106931; ... ; 0.04335781638983175;  
0.015768401601296996]  
[0.1988589864927692; 0.2449120041029459; ... ; 0.0428912119876863;  
0.01419413008505466]  
[0.20321691103805198; 0.24979304381227324; ... ; 0.042502691453971654;  
0.012695923012047552]  
[0.20746957751438483; 0.2544904002332157; ... ; 0.04218787380166034;  
0.011269431519685633]  
[0.21161912817529688; 0.2590123187310061; ... ; 0.04194259533191489;  
0.009910548900977893]  
[0.21566769434990687; 0.26336665803580256; ... ; 0.04176289914101123;  
0.008615397206386217]  
[0.21961739358874557; 0.2675609089620249; ... ; 0.04164502513841603;  
0.00738031458821027]  
[0.22347032708806092; 0.2716022121937417; ... ; 0.04158540055053476;  
0.006201843346197726]  
[0.22722857737269758; 0.2754973751840171; ... ; 0.041580630885952256;  
0.005076718635381264]  
[0.23089420621892223; 0.2792528882136084; ... ; 0.04162749133922435;  
0.0040018577993214555]  
[0.23446925279976755; 0.28287493965202265; ... ; 0.04172291861145095;  
0.0029743502939905964]  
[0.23795573203659579; 0.2863694304616856; ... ; 0.04186400312697108;  
0.001991448169472848]  
[0.24135563314164166; 0.28974198798384027; ... ; 0.04204798162657295;  
0.0010505570784879136]  
[0.2446709183372874; 0.29299797904277286; ... ; 0.04227223011860912;  
0.00014922778247463038]  
:  
[0.3560311020842177; 0.5258931013784227; ... ; 0.19119082667766718; -  
0.1240092553586277]  
[0.3559804849949585; 0.5261042458301325; ... ; 0.1913688607901559; -  
0.12418093089389928]  
[0.3559299586599146; 0.526314834685809; ... ; 0.19154646838784137; -  
0.12435215027392318]  
[0.3558795232813288; 0.5265248693396044; ... ; 0.1917236501632261; -  
0.1245229145616665]  
[0.35582917905614864; 0.5267343511818305; ... ; 0.19190040680998252; -  
0.12469322481958113]  
[0.3557789261761005; 0.526943281598985; ... ; 0.19207673902294317; -  
0.12486308210957267]

[0.3557287648277624; 0.5271516619737763; ... ; 0.19225264749809043; -  
0.12503248749297]  
[0.35567869519263545; 0.5273594936851492; ... ; 0.19242813293254601; -  
0.12520144203049532]  
[0.3556287174472149; 0.5275667781083091; ... ; 0.19260319602456016; -  
0.12536994678223473]  
[0.3555788317630593; 0.5277735166147465; ... ; 0.1927778374735006; -  
0.12553800280760932]  
[0.35552903830685934; 0.5279797105722606; ... ; 0.1929520579798411; -  
0.12570561116534673]  
[0.3554793372405051; 0.5281853613449832; ... ; 0.19312585824514988; -  
0.12587277291345333]  
[0.3554297287211529; 0.5283904702934017; ... ; 0.1932992389720778; -  
0.12603948910918675]  
[0.3553802129012906; 0.5285950387743819; ... ; 0.19347220086434613; -  
0.12620576080902896]  
[0.35533078992880224; 0.5287990681411904; ... ; 0.19364474462673437; -  
0.12637158906865983]  
[0.3552814599470317; 0.529002559743517; ... ; 0.19381687096506756; -  
0.12653697494293126]  
[0.3552322230948455; 0.529205514927496; ... ; 0.19398858058620358; -  
0.12670191948584147]  
[0.35518307950669425; 0.5294079350357284; ... ; 0.19415987419802025; -  
0.1268664237505102]  
[0.35513402931267407; 0.5296098214073022; ... ; 0.19433075250940204; -  
0.12703048878915388]  
[0.35508507263858613; 0.5298111753778136; ... ; 0.1945012162302269; -  
0.1271941156530617]  
[0.35503620960599597; 0.5300119982793878; ... ; 0.19467126607135263; -  
0.12735730539257178]  
[0.35498744033229174; 0.5302122914406987; ... ; 0.1948409027446033; -  
0.12752005905704789]  
[0.35493876493074167; 0.5304120561869887; ... ; 0.19501012696275544; -  
0.12768237769485657]  
[0.3548901835105507; 0.530611293840089; ... ; 0.19517893943952397; -  
0.1278442623533449]  
[0.3548416961769162; 0.5308100057184378; ... ; 0.1953473408895482; -  
0.1280057140788182]  
[0.354793303031083; 0.5310081931371003; ... ; 0.1955153320283776; -  
0.12816673391651862]  
[0.3547450041703976; 0.5312058574077869; ... ; 0.1956829135724574; -  
0.12832732291060384]  
[0.35469679968836176; 0.5314029998388714; ... ; 0.19585008623911415; -  
0.12848748210412633]  
[0.3546486896746849; 0.5315996217354096; ... ; 0.19601685074654107; -  
0.12864721253901285]  
[0.3546006742153361; 0.5317957243991571; ... ; 0.19618320781378346; -  
0.12880651525604447]  
[0.3545527533925955; 0.5319913091285865; ... ; 0.1963491581607239; -  
0.12896539129483686]

```
[0.3545049272851047; 0.532186377218905; ... ; 0.19651470250806732; -
0.12912384169382105]
[0.3544571959679163; 0.5323809299620718; ... ; 0.19667984157732613; -
0.12928186749022444]
[0.35440955951254327; 0.5325749686468141; ... ; 0.19684457609080508; -
0.12943946972005235]
[0.3543620179870071; 0.5327684945586444; ... ; 0.19700890677158633; -
0.12959664941806973]
```

```
julia> y=Float64[]
0-element Array{Float64,1}
```

```
julia> for i=1:500
           push!(y,norm(x[i]-xValues))
       end
```

```
julia> using PyPlot
[ Info: Precompiling PyPlot [d330b81b-6aea-500a-939a-2ce795aea3ee]
[ Info: Installing matplotlib via the Conda matplotlib package...
[ Info: Running `conda install -y matplotlib` in root environment
Collecting package metadata (current_repodata.json): done
Solving environment: done
```

```
## Package Plan ##
```

```
environment location: /Users/vikas/.julia/conda/3
```

```
added / updated specs:
- matplotlib
```

The following packages will be downloaded:

package	build	
cycler-0.10.0	py37_0	14 KB
freetype-2.9.1	hb4e5f40_0	555 KB
kiwisolver-1.1.0	py37h0a44026_0	54 KB
libpng-1.6.37	ha441bb4_0	262 KB
matplotlib-3.1.1	py37h54f8f79_0	4.9 MB
pyparsing-2.4.2	py_0	61 KB
python-dateutil-2.8.0	py37_0	265 KB
pytz-2019.3	py_0	231 KB
tornado-6.0.3	py37h1de35cc_0	590 KB
Total:		6.9 MB

The following NEW packages will be INSTALLED:

```
cycler          pkgs/main/osx-64::cycler-0.10.0-py37_0
```

freetype	pkgs/main/osx-64::freetype-2.9.1-hb4e5f40_0
kiwisolver	pkgs/main/osx-64::kiwisolver-1.1.0-py37h0a44026_0
libpng	pkgs/main/osx-64::libpng-1.6.37-ha441bb4_0
matplotlib	pkgs/main/osx-64::matplotlib-3.1.1-py37h54f8f79_0
pyparsing	pkgs/main/noarch::pyparsing-2.4.2-py_0
python-dateutil	pkgs/main/osx-64::python-dateutil-2.8.0-py37_0
pytz	pkgs/main/noarch::pytz-2019.3-py_0
tornado	pkgs/main/osx-64::tornado-6.0.3-py37h1de35cc_0

## Downloading and Extracting Packages

tornado-6.0.3	590 KB	
#####		
#####		
#####		
#####	100%	
matplotlib-3.1.1	4.9 MB	
#####		
#####		
#####		
#####	100%	
freetype-2.9.1	555 KB	
#####		
#####		
#####		
#####	100%	
python-dateutil-2.8.	265 KB	
#####		
#####		
#####		
#####	100%	
libpng-1.6.37	262 KB	
#####		
#####		
#####		
#####	100%	
kiwisolver-1.1.0	54 KB	
#####		
#####		
#####		
#####	100%	
pyparsing-2.4.2	61 KB	
#####		
#####		
#####		
#####	100%	
cycler-0.10.0	14 KB	
#####		
#####		

```
#####
##### | 100%
pytz-2019.3 | 231 KB |
#####
#####
#####
##### | 100%
Preparing transaction: done
Verifying transaction: done
Executing transaction: done
[ Info: Installing pyqt package to avoid buggy tkagg backend.
[ Info: Installing PyQt5 via the Conda pyqt package...
[ Info: Running `conda install -y pyqt` in root environment
Collecting package metadata (current_repodata.json): done
Solving environment: done
```

## ## Package Plan ##

environment location: /Users/vikas/.julia/conda/3

added / updated specs:  
- pyqt

The following packages will be downloaded:

package	build	
dbus-1.13.12	h90a0687_0	516 KB
expat-2.2.6	h0a44026_0	111 KB
gettext-0.19.8.1	h15daf44_3	2.6 MB
glib-2.56.2	hd9629dc_0	3.7 MB
icu-58.2	h4b95b61_1	10.1 MB
jpeg-9b	he5867d9_2	201 KB
libiconv-1.15	hdd342a3_7	671 KB
pcre-8.43	h0a44026_0	185 KB
pyqt-5.9.2	py37h655552a_2	3.6 MB
qt-5.9.7	h468cd18_1	62.0 MB
sip-4.19.8	py37h0a44026_0	237 KB
Total:		84.0 MB

The following NEW packages will be INSTALLED:

```
dbus      pkgs/main/osx-64::dbus-1.13.12-h90a0687_0
expat     pkgs/main/osx-64::expat-2.2.6-h0a44026_0
gettext   pkgs/main/osx-64::gettext-0.19.8.1-h15daf44_3
glib      pkgs/main/osx-64::glib-2.56.2-hd9629dc_0
icu       pkgs/main/osx-64::icu-58.2-h4b95b61_1
jpeg      pkgs/main/osx-64::jpeg-9b-he5867d9_2
```



```
libiconv      pkgs/main/osx-64::libiconv-1.15-hdd342a3_7
pcre          pkgs/main/osx-64::pcre-8.43-h0a44026_0
pyqt          pkgs/main/osx-64::pyqt-5.9.2-py37h655552a_2
qt            pkgs/main/osx-64::qt-5.9.7-h468cd18_1
sip           pkgs/main/osx-64::sip-4.19.8-py37h0a44026_0
```

## Downloading and Extracting Packages

```
gettext-0.19.8.1 | 2.6 MB |
#####
#####
#####
##### | 100%
pcre-8.43 | 185 KB |
#####
#####
#####
##### | 100%
qt-5.9.7 | 62.0 MB |
#####
#####
#####
##### | 100%
sip-4.19.8 | 237 KB |
#####
#####
#####
##### | 100%
icu-58.2 | 10.1 MB |
#####
#####
#####
##### | 100%
dbus-1.13.12 | 516 KB |
#####
#####
#####
##### | 100%
jpeg-9b | 201 KB |
#####
#####
#####
##### | 100%
glib-2.56.2 | 3.7 MB |
#####
#####
#####
##### | 100%
```

```
expat-2.2.6          | 111 KB      |
#####
#####
#####
##### | 100%
pyqt-5.9.2           | 3.6 MB      |
#####
#####
#####
##### | 100%
libiconv-1.15         | 671 KB      |
#####
#####
#####
##### | 100%
Preparing transaction: done
Verifying transaction: done
Executing transaction: done
```

```
julia> plot(y)
1-element Array{PyCall.PyObject,1}:
PyObject <matplotlib.lines.Line2D object at 0x15238fd90>
```

```
julia> 2019-10-31 21:22:16.278 julia[10343:155471] WARNING:
<NSSavePanel: 0x7f818786f650> -[NSSavePanel(exportedInterface)
requestAppEnabledStateForItems:replyBlock:] no longer has a delegate
to respond to shouldEnableURL
```

```
julia> using LinearAlgebra
```

```
julia> b = rand(20,1)
20×1 Array{Float64,2}:
 0.5211416944883587
 0.9005989514835786
 0.2516344041714733
 0.8736423118017216
 0.5587142259747699
 0.2169069865321367
 0.24155518352390581
 0.47986717643909915
 0.3416691442001125
 0.9868931838082733
 0.6420339329725309
 0.3224339105533227
 0.3686869344419803
 0.6109494589222568
 0.7593345111883196
 0.7013307679700149
 0.2010457965624719
 0.6632286213380247
```

```
0.11178870797051021
0.407104299625195
```

```
julia> A = rand(20,10)
20×10 Array{Float64,2}:
```

```
 0.98969  0.918003  0.280844  0.334156  0.949868  0.872779
 0.991365  0.69015  0.577725  0.061376
 0.259009  0.106294  0.369693  0.97456  0.82365  0.684343
 0.559557  0.829187  0.523578  0.115873
 0.810588  0.902172  0.189974  0.22505  0.58084  0.319768
 0.389917  0.16281  0.786399  0.121555
 0.226433  0.914398  0.665201  0.478702  0.372356  0.64081
 0.982789  0.465388  0.456873  0.0770228
 0.526291  0.253509  0.00888321  0.0719382  0.191052  0.994025
 0.539872  0.262632  0.0126875  0.104097
 0.405279  0.569849  0.909028  0.140794  0.813032  0.161998
 0.0729473  0.760726  0.297431  0.977669
 0.592944  0.253104  0.00693795  0.29144  0.871723  0.484639
 0.0780678  0.775576  0.486094  0.514308
 0.450977  0.630721  0.171179  0.954811  0.277379  0.377905
 0.130714  0.2371  0.91254  0.240433
 0.776676  0.126128  0.55254  0.408844  0.560805  0.14075
 0.195581  0.512799  0.91589  0.846498
 0.641897  0.710995  0.205365  0.642206  0.12825  0.282095
 0.710488  0.0371411  0.889734  0.589196
 0.43654  0.0615965  0.555471  0.984003  0.645016  0.180488
 0.463061  0.114431  0.527285  0.491009
 0.750325  0.616714  0.604156  0.607242  0.627006  0.373489
 0.236573  0.367122  0.33281  0.0625033
 0.160124  0.0133291  0.733457  0.603848  0.766453  0.24034
 0.615005  0.808245  0.618243  0.290981
 0.742633  0.620776  0.17193  0.69797  0.760657  0.844822
 0.969518  0.709696  0.840067  0.00115719
 0.875965  0.464349  0.625259  0.0597163  0.572282  0.453351
 0.469924  0.496802  0.0574514  0.89785
 0.342097  0.551403  0.0908372  0.995796  0.0539509  0.907512
 0.741341  0.545851  0.980193  0.97747
 0.7916  0.429463  0.105604  0.214902  0.110766  0.386175
 0.355029  0.876417  0.0711055  0.0527927
 0.746392  0.697345  0.414012  0.124422  0.732965  0.703075
 0.669342  0.0414  0.823715  0.372362
 0.0518788  0.972306  0.799221  0.640098  0.736648  0.903405
 0.679558  0.143322  0.124349  0.12412
 0.865814  0.842755  0.581619  0.162625  0.876825  0.318628
 0.890183  0.0118105  0.0983222  0.621615
```

```
julia> xValues=inv(A'A)*(A'b)
10×1 Array{Float64,2}:
 0.2854999723154915
-0.2724453530960944
```

0.18509991614994736  
0.2153748366222299  
-0.2532840558736913  
0.1834537409889272  
0.4944896746137868  
-0.06339379326389771  
0.13094384947861598  
0.14113303574811534

```
julia> result=1/((norm(A))^2)
0.014910601845730485
```

```
julia> x=Array{Array{Float64}}(undef,500)
500-element Array{Array{Float64,N} where N,1}:
```

[illegible]



```

julia> x[1]=x0
10×1 Adjoint{Float64,Array{Float64,2}}:
 0.0
 0.0
 0.0
 0.0
 0.0
 0.0
 0.0
 0.0
 0.0
 0.0

julia> for i=2:500
           x[i]=x[i-1]-(result*A')*((A*x[i-1])-b)
       end

julia> x
500-element Array{Array{Float64,N} where N,1}:
 [0.0; 0.0; ... ; 0.0; 0.0]
 [0.08564267851428042; 0.0795679847160903; ... ; 0.08529136647916344;
 0.05889603865249705]
 [0.10491123453698534; 0.09510962698080626; ... ; 0.10802147250267605;
 0.07428196827590668]
 [0.10871675964623216; 0.09569590534287921; ... ; 0.11589963164205062;
 0.07947011505706997]
 [0.10898782110207628; 0.09282761308424242; ... ; 0.1201195878569099;
 0.0822667239514701]
 [0.10851544864337595; 0.08919887719117242; ... ; 0.12331499653513334;
 0.08449939378644002]
 [0.10794903242832464; 0.0854395612016998; ... ; 0.1261124495286896;
 0.08659445882565205]
 [0.10743620506039195; 0.08169573532634222; ... ; 0.1286675848316127;
 0.08864995394035814]
 [0.10700722965737758; 0.07800014683774587; ... ; 0.13102518817890796;
 0.09068711603034649]
 [0.10666509042304124; 0.07435905672391069; ... ; 0.1332036272927001;
 0.09270932810563656]
 [0.10640659813796055; 0.07077259049481924; ... ; 0.1352146662058095;
 0.09471592689642873]
 [0.10622732563936065; 0.06723950440207561; ... ; 0.13706813099970724;
 0.09670543063883663]
 [0.10612275354674919; 0.06375829873710381; ... ; 0.1387730235085789;
 0.09867628737241588]
 [0.1060885282351274; 0.06032747507675546; ... ; 0.14033780137310836;
 0.10062704250735541]
 [0.10612051227738979; 0.0569455930734398; ... ; 0.14177046170819807;
 0.10255637071916959]
 [0.10621478677543279; 0.053611280455617666; ... ; 0.1430785778144261;
 0.10446307647079608]

```

[0.10636764292073762; 0.05032323224825414; ... ; 0.14426932400803597;  
0.10634608758688902]  
[0.10657557151042496; 0.04708020764381126; ... ; 0.14534949683606507;  
0.10820444758301276]  
[0.10683525243866906; 0.04388102649017127; ... ; 0.1463255346568556;  
0.11003730806506695]  
[0.10714354461274525; 0.04072456584715045; ... ; 0.14720353609043582;  
0.11184392148700646]  
[0.10749747637610253; 0.03760975670869977; ... ; 0.147989277495261;  
0.11362363431522819]  
[0.1078942364360681; 0.03453558090525095; ... ; 0.1486882295442682;  
0.11537588059285825]  
[0.10833116527506723; 0.03150106818174532; ... ; 0.14930557295175595;  
0.11710017588523969]  
[0.10880574702094326; 0.028505293442873232; ... ; 0.14984621339580895;  
0.118796111586061]  
[0.10931560175222188; 0.025547374156515052; ... ; 0.1503147956777204;  
0.12046334956401673]  
[0.10985847821520289; 0.022626467906630695; ... ; 0.1507157171575116;  
0.12210161713083642]  
[0.11043224693093225; 0.019741770087265655; ... ; 0.15105314050258872;  
0.12371070231253284]  
[0.11103489367125952; 0.016892511729782386; ... ; 0.1513310057846664;  
0.1252904494067093]  
[0.11166451328428628; 0.014077957455852764; ... ; 0.15155304195828193;  
0.12684075480970733]  
[0.11231930385055676; 0.011297403549153888; ... ; 0.15172277775251686;  
0.1283615630982685]  
[0.11299756115233214; 0.00855017613909484; ... ; 0.1518435520059212;  
0.1298528633512282]  
[0.11369767343922872; 0.005835629490266617; ... ; 0.15191852347309853;  
0.1313146856975581]  
[0.1144181164743884; 0.0031531443916529315; ... ; 0.1519506801299522;  
0.13274709807782864]  
[0.1151574488461918; 0.0005021266399661442; ... ; 0.1519428480032099;  
0.13415020320687795]  
[0.11591430753132163; -0.002117994388218029; ... ; 0.15189769954853152;  
0.1355241357261487]  
[0.11668740369573857; -0.004707767080560913; ... ; 0.1518177616002604;  
0.13686905953479273]  
:  
[0.27236382348156185; -0.25641255807141033; ... ; 0.12026070666599581;  
0.15246077229089114]  
[0.2724262322513196; -0.25648317108768437; ... ; 0.12029464993799824;  
0.1524146717165298]  
[0.2724882854362732; -0.2565534083502912; ... ; 0.12032852858204644;  
0.152368769613905]  
[0.27254998552784454; -0.25662327252953865; ... ; 0.1203623422302693;  
0.15232306507258986]

[0.2726113349969785; -0.256692766270881; ... ; 0.12039609052214172;  
0.15227755718608496]  
[0.27267233629432525; -0.25676189219519024; ... ; 0.12042977310439557;  
0.15223224505181726]  
[0.2727329918504217; -0.25683065289902435; ... ; 0.12046338963093167;  
0.15218712777113838]  
[0.27279330407587105; -0.2568990509548921; ... ; 0.12049693976273283;  
0.15214220444932272]  
[0.2728532753615204; -0.2569670889115151; ... ; 0.12053042316777791;  
0.1520974741955649]  
[0.2729129080786373; -0.25703476929408625; ... ; 0.12056383952095684;  
0.15205293612297693]  
[0.2729722045790842; -0.257102094604526; ... ; 0.12059718850398665;  
0.15200858934858472]  
[0.2730311671954919; -0.2571690673217346; ... ; 0.12063046980532857;  
0.1519644329933244]  
[0.2730897982414306; -0.25723568990184237; ... ; 0.12066368312010593;  
0.1519204661820382]  
[0.2731481000115802; -0.2573019647784561; ... ; 0.12069682815002318;  
0.1518766880434698]  
[0.27320607478189873; -0.2573678943629035; ... ; 0.1207299046032857;  
0.15183309771025938]  
[0.27326372480978905; -0.257433481044474; ... ; 0.12076291219452069;  
0.15178969431893843]  
[0.2733210523342645; -0.2574987271906571; ... ; 0.12079585064469887;  
0.15174647700992397]  
[0.2733780595761125; -0.257563635147378; ... ; 0.12082871968105709;  
0.15170344492751253]  
[0.2734347487380572; -0.2576282072392304; ... ; 0.12086151903702191;  
0.1516605972198739]  
[0.2734911220049202; -0.25769244576970635; ... ; 0.120894248452134;  
0.1516179330390444]  
[0.27354718154378016; -0.25775635302142375; ... ; 0.12092690767197342;  
0.1515754515409198]  
[0.2736029295041306; -0.25781993125635105; ... ; 0.12095949644808575;  
0.1515331518852482]  
[0.2736583680180368; -0.25788318271602934; ... ; 0.12099201453790911;  
0.1514910332356223]  
[0.2737134992002904; -0.25794610962179176; ... ; 0.12102446170470203;  
0.15144909475947146]  
[0.2737683251485637; -0.25800871417498067; ... ; 0.12105683771747204;  
0.15140733562805372]  
[0.27382284794356154; -0.25807099855716176; ... ; 0.12108914235090523;  
0.1513657550164472]  
[0.27387706964917247; -0.25813296493033616; ... ; 0.12112137538529648;  
0.1513243521035415]  
[0.27393099231261814; -0.2581946154371498; ... ; 0.12115353660648057;  
0.1512831260720287]  
[0.2739846179646016; -0.2582559522011004; ... ; 0.12118562580576407;  
0.1512420761083942]



```
[0.2740379486194541; -0.25831697732674236; ... ; 0.12121764277985797;  
0.15120120140290727]  
[0.2740909862752804; -0.25837769289988854; ... ; 0.12124958733081112;  
0.15116050114961135]  
[0.27414373291410327; -0.2584381009878104; ... ; 0.1212814592659444;  
0.15111997454631426]  
[0.27419619050200594; -0.2584982036394355; ... ; 0.12131325839778564;  
0.15107962079457804]  
[0.27424836098927396; -0.25855800288554276; ... ; 0.12134498454400533;  
0.15103943909970868]  
[0.2743002463105351; -0.2586175007389555; ... ; 0.12137663752735295;  
0.15099942867074562]
```

```
julia> y=Float64[]  
0-element Array{Float64,1}
```

```
julia> for i=1:500  
           push!(y,norm(x[i]-xValues))  
       end
```

```
julia> using PyPlot
```

```
julia> plot(y)  
1-element Array{PyCall.PyObject,1}:  
PyObject <matplotlib.lines.Line2D object at 0x1549f4fd0>
```