```mathematica
Needs["Histograms`"]

tocke = Import["~/Desktop/EdEData.dat"];

s1 = ListPlot[tocke, PlotStyle → {PointSize[0.001]}, PlotRange → {{0, 3000}, {0, 2000}}]
```
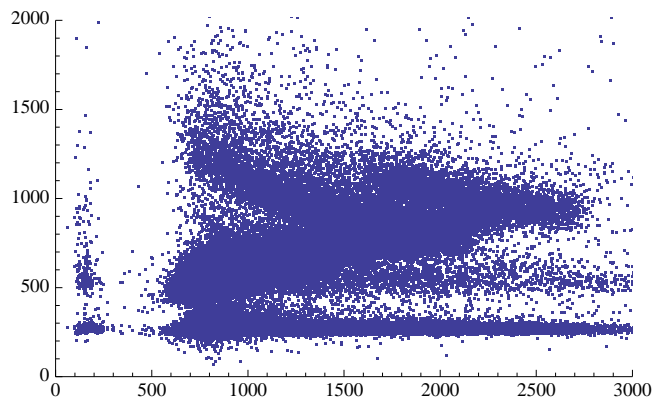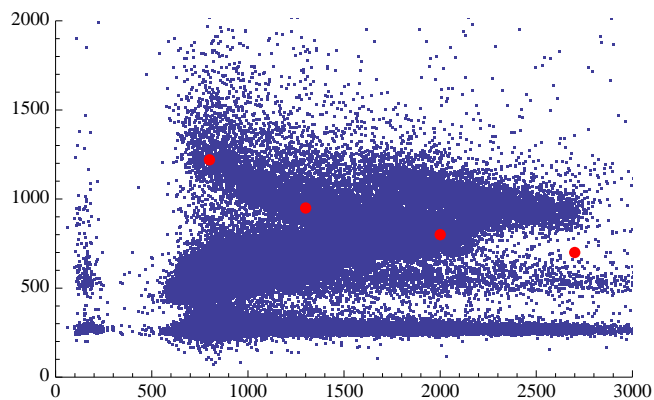


```mathematica
fitPoints = {{800, 1220}, {1300, 950}, {2000, 800}, {2700, 700}}
```

{{800, 1220}, {1300, 950}, {2000, 800}, {2700, 700}}

```mathematica
s2 = Show[s1, Graphics[Map[{Hue[0], PointSize[0.02], Point[#]} &, fitPoints]]]
```
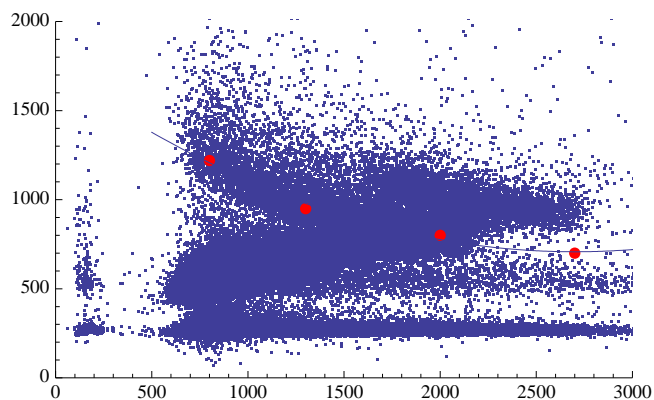


```mathematica
fit1 = FindFit[fitPoints, a * x^2 + b * x + c, {a, b, c}, x]
```

{a → 0.000138237, b → -0.746872, c → 1716.49}

```mathematica
F[x_] := a * x^2 + b * x + c /. fit1

Show[s2, Plot[F[x], {x, 500, 3000}, PlotStyle → {}]]
```



```mathematica
Points = Take[tocke, 100 000];
```

```
D[a * x^2 + b * x + c, x]
```

$b + 2 a x$

```
DF[x_] := b + 2 a x /. fit1
```

```
G[x_, {x1_, y1_}] := (x - x1)^2 + (F[x] - y1)^2
```

```
G[1500, Points[[1]]]
```

250 990.

```
DG[x_, {x1_, y1_}] := 2 (x - x1) + 2 (F[x] - y1) * DF[x]
```

```
DG[1500, Points[[1]]]
```

615.548

```
Simplify[Solve[DG[x, {x1, y1}] == 0, x, Reals]]
```

$$\left\{\left\{x \to 2701.43 + \left(\left(2.74717 \times 10^6 - 4.75824 \times 10^6\, \mathbb{i}\right)\left(5.48357 \times 10^{-7} - 1.26798 \times 10^{-10}\, y1\right)\right) \Big/ \right.\right.$$

$$\left(-8.52314 \times 10^{-10} + 3.15505 \times 10^{-13}\, x1 + \sqrt{\left(4.\left(5.48357 \times 10^{-7} - 1.26798 \times 10^{-10}\, y1\right)^3 + \right.}\right.$$

$$\left.\left(8.52314 \times 10^{-10} - 3.15505 \times 10^{-13}\, x1 + 5.04871 \times 10^{-29}\, y1\right)^2\right) - 5.04871 \times 10^{-29}\, y1\right)^{1/3} -$$

$$\left(1.73061 \times 10^6 + 2.9975 \times 10^6\, \mathbb{i}\right)\left(-8.52314 \times 10^{-10} + 3.15505 \times 10^{-13}\, x1 + \right.$$

$$\sqrt{\left(4.\left(5.48357 \times 10^{-7} - 1.26798 \times 10^{-10}\, y1\right)^3 + \right.}$$

$$\left.\left(8.52314 \times 10^{-10} - 3.15505 \times 10^{-13}\, x1 + 5.04871 \times 10^{-29}\, y1\right)^2\right) - 5.04871 \times 10^{-29}\, y1\right)^{1/3}\Big\},$$

$$\left\{x \to 2701.43 + \left(\left(2.74717 \times 10^6 + 4.75824 \times 10^6\, \mathbb{i}\right)\left(5.48357 \times 10^{-7} - 1.26798 \times 10^{-10}\, y1\right)\right) \Big/ \right.$$

$$\left(-8.52314 \times 10^{-10} + 3.15505 \times 10^{-13}\, x1 + \sqrt{\left(4.\left(5.48357 \times 10^{-7} - 1.26798 \times 10^{-10}\, y1\right)^3 + \right.}\right.$$

$$\left.\left(8.52314 \times 10^{-10} - 3.15505 \times 10^{-13}\, x1 + 5.04871 \times 10^{-29}\, y1\right)^2\right) - 5.04871 \times 10^{-29}\, y1\right)^{1/3} -$$

$$\left(1.73061 \times 10^6 - 2.9975 \times 10^6\, \mathbb{i}\right)\left(-8.52314 \times 10^{-10} + 3.15505 \times 10^{-13}\, x1 + \right.$$

$$\sqrt{\left(4.\left(5.48357 \times 10^{-7} - 1.26798 \times 10^{-10}\, y1\right)^3 + \right.}$$

$$\left.\left(8.52314 \times 10^{-10} - 3.15505 \times 10^{-13}\, x1 + 5.04871 \times 10^{-29}\, y1\right)^2\right) - 5.04871 \times 10^{-29}\, y1\right)^{1/3}\Big\},$$

$$\left\{x \to 2701.43 - \left(5.49434 \times 10^6\left(5.48357 \times 10^{-7} - 1.26798 \times 10^{-10}\, y1\right)\right) \Big/ \right.$$

$$\left(-8.52314 \times 10^{-10} + 3.15505 \times 10^{-13}\, x1 + \sqrt{\left(4.\left(5.48357 \times 10^{-7} - 1.26798 \times 10^{-10}\, y1\right)^3 + \right.}\right.$$

$$\left.\left(8.52314 \times 10^{-10} - 3.15505 \times 10^{-13}\, x1 + 5.04871 \times 10^{-29}\, y1\right)^2\right) - 5.04871 \times 10^{-29}\, y1\right)^{1/3} +$$

$$3.46122 \times 10^6\left(-8.52314 \times 10^{-10} + 3.15505 \times 10^{-13}\, x1 + \sqrt{\left(4.\left(5.48357 \times 10^{-7} - 1.26798 \times 10^{-10}\, y1\right)^3 + \right.}\right.$$

$$\left.\left.\left.\left(8.52314 \times 10^{-10} - 3.15505 \times 10^{-13}\, x1 + 5.04871 \times 10^{-29}\, y1\right)^2\right) - 5.04871 \times 10^{-29}\, y1\right)^{1/3}\right\}\right\}$$

$\{\{x \to 1249.49\}, \{x \to 3427.4 - 5332.09\, \mathbb{i}\}, \{x \to 3427.4 + 5332.09\, \mathbb{i}\}\}$

```
x /. FindRoot[DG[x, Points[[5]]] == 0, {x, 2000}]
```

1083.12

```
H[{x1_, y1_}] := If [y1 ≥ F[x1], Sqrt[G[x, {x1, y1}]], -Sqrt[G[x, {x1, y1}]]] /.
  FindRoot[DG[x, {x1, y1}] == 0, {x, 2000}]
```

```
res = Map[H[#] &, tocke];
```

FindRoot::lstol :

    The line search decreased the step size to within tolerance specified by AccuracyGoal and
        PrecisionGoal but was unable to find a sufficient decrease in the merit function. You may
        need more than MachinePrecision digits of working precision to meet these tolerances. ≫
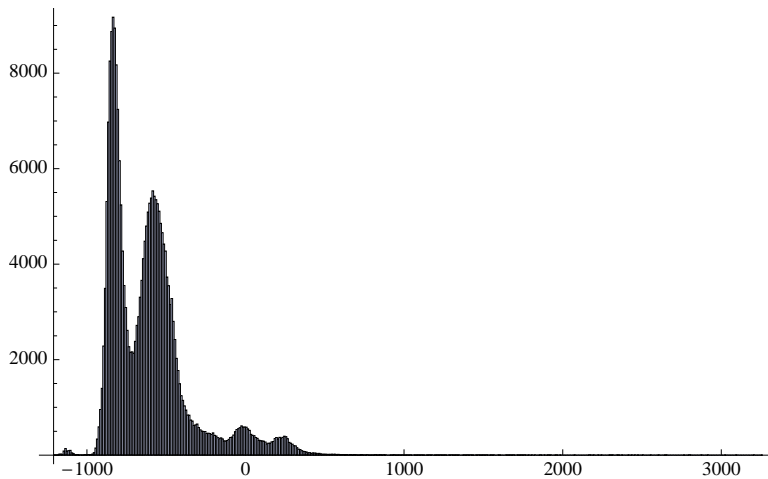
FindRoot::lstol :

    The line search decreased the step size to within tolerance specified by AccuracyGoal and
        PrecisionGoal but was unable to find a sufficient decrease in the merit function. You may
        need more than MachinePrecision digits of working precision to meet these tolerances. ≫
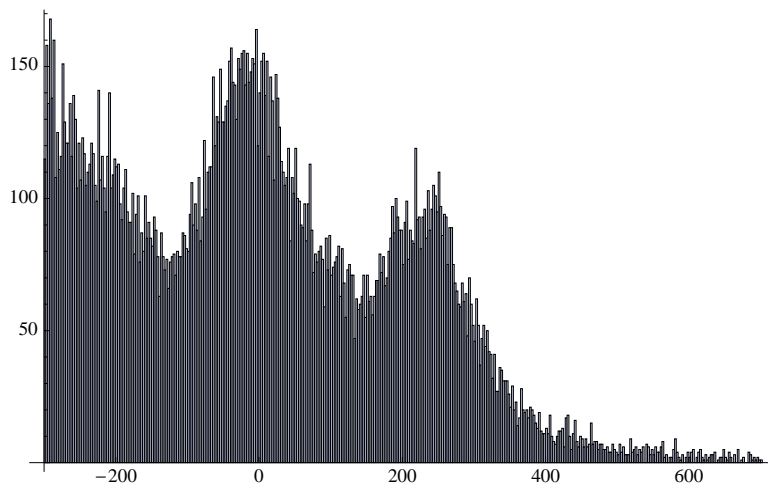
FindRoot::lstol :

    The line search decreased the step size to within tolerance specified by AccuracyGoal and
        PrecisionGoal but was unable to find a sufficient decrease in the merit function. You may
        need more than MachinePrecision digits of working precision to meet these tolerances. ≫

General::stop : Further output of FindRoot::lstol will be suppressed during this calculation. ≫

```
Histogram[res, HistogramCategories → 500]
```



```
Histogram[res, HistogramCategories → 300, HistogramRange → {-300, 700}]
```



```
HA[{x1_, y1_}] := If [y1 ≥ F[x1] && Sqrt[G[x, {x1, y1}]] > 150.0, {x1, y1}, {0, 0}] /.
  FindRoot[DG[x, {x1, y1}] == 0, {x, 2000}]
```

```
res2 = Map[HA[#] &, Points];
```

FindRoot::lstol :

    The line search decreased the step size to within tolerance specified by AccuracyGoal and
        PrecisionGoal but was unable to find a sufficient decrease in the merit function. You may
        need more than MachinePrecision digits of working precision to meet these tolerances. ≫

FindRoot::lstol :

    The line search decreased the step size to within tolerance specified by AccuracyGoal and
        PrecisionGoal but was unable to find a sufficient decrease in the merit function. You may
        need more than MachinePrecision digits of working precision to meet these tolerances. ≫
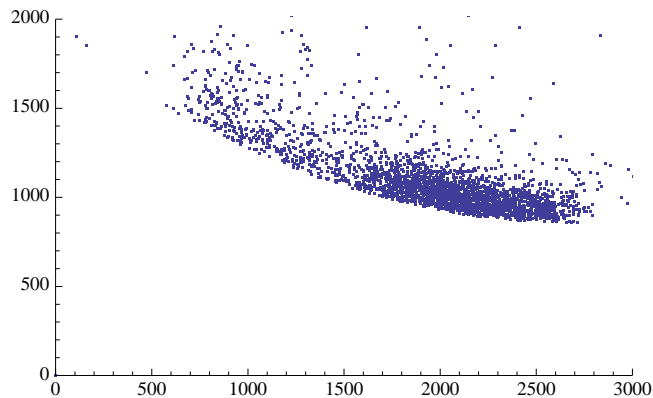
FindRoot::lstol :

    The line search decreased the step size to within tolerance specified by AccuracyGoal and
        PrecisionGoal but was unable to find a sufficient decrease in the merit function. You may
        need more than MachinePrecision digits of working precision to meet these tolerances. ≫

General::stop : Further output of FindRoot::lstol will be suppressed during this calculation. ≫

```
ListPlot[res2, PlotStyle → {PointSize[0.001]}, PlotRange → {{0, 3000}, {0, 2000}}]
```
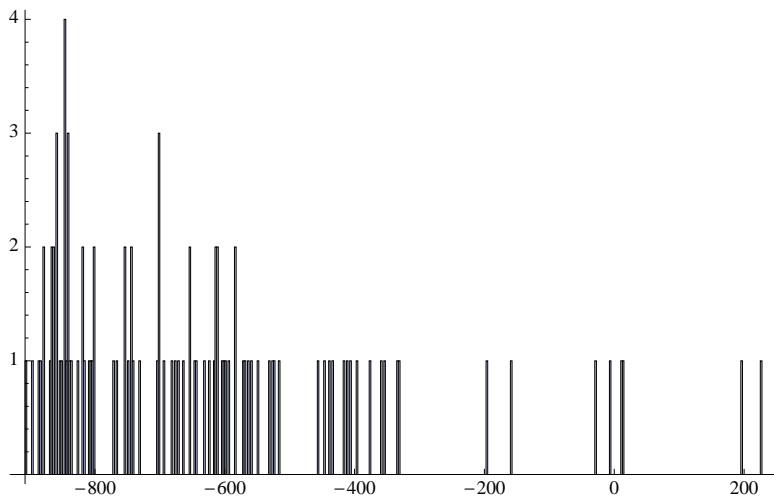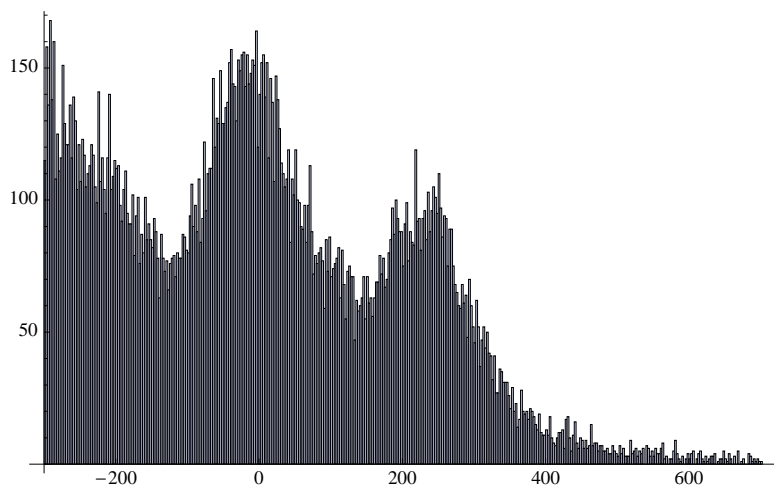
Druga Pot

```
Expand[2701.4263559564183` -
  (5.494341566907201`*^6 (5.483566388684924`*^-7 - 1.2679755640099741`*^-10 y1)) /
  (-8.523142260999616`*^-10 + 3.1550526047866546`*^-13 x1 +
    √(4.` (5.483566388684924`*^-7 - 1.2679755640099741`*^-10 y1)^3 +
      (8.523142260999616`*^-10 - 3.1550526047866546`*^-13 x1 +
        5.048709793414476`*^-29 y1)^2) - 5.048709793414476`*^-29 y1)^(1/3) +
  3.461218297729382`*^6 (-8.523142260999616`*^-10 + 3.1550526047866546`*^-13 x1 +
    √(4.` (5.483566388684924`*^-7 - 1.2679755640099741`*^-10 y1)^3 +
      (8.523142260999616`*^-10 - 3.1550526047866546`*^-13 x1 +
        5.048709793414476`*^-29 y1)^2) - 5.048709793414476`*^-29 y1)^(1/3)]
```

$$2701.43 -$$
$$3.01286 \Big/ \left(-8.52314\times10^{-10} + 3.15505\times10^{-13}\, x1 + \sqrt{\left(4.\ \left(5.48357\times10^{-7} - 1.26798\times10^{-10}\, y1\right)^3 + \right.}\right.$$
$$\left.\left(8.52314\times10^{-10} - 3.15505\times10^{-13}\, x1 + 5.04871\times10^{-29}\, y1\right)^2\right) - 5.04871\times10^{-29}\, y1\right)^{1/3} +$$
$$3.46122\times10^{6} \left(-8.52314\times10^{-10} + 3.15505\times10^{-13}\, x1 + \sqrt{\left(4.\ \left(5.48357\times10^{-7} - 1.26798\times10^{-10}\, y1\right)^3 + \right.}\right.$$
$$\left.\left(8.52314\times10^{-10} - 3.15505\times10^{-13}\, x1 + 5.04871\times10^{-29}\, y1\right)^2\right) - 5.04871\times10^{-29}\, y1\right)^{1/3} +$$
$$\left(0.000696669\, y1\right) \Big/ \left(-8.52314\times10^{-10} + 3.15505\times10^{-13}\, x1 + \right.$$
$$\sqrt{\left(4.\ \left(5.48357\times10^{-7} - 1.26798\times10^{-10}\, y1\right)^3 + \right.}$$
$$\left.\left(8.52314\times10^{-10} - 3.15505\times10^{-13}\, x1 + 5.04871\times10^{-29}\, y1\right)^2\right) - 5.04871\times10^{-29}\, y1\right)^{1/3}$$

```
Hulu[{x1_, y1_}] := 2701.426355956418 - 3.012858674424678 /
  (-8.52314226099961 * Power[10, -10] + 3.15505260478665 * Power[10, -13] * x1 + Sqrt[
    (4. (5.483566388684924 * Power[10, -7] - 1.2679755640099741 * Power[10, -10] * y1)^3 +
      (8.523142260999616 * Power[10, -10] - 3.1550526047866546 * Power[10, -13] * x1 +
        5.048709793414476 * Power[10, -29] * y1)^2)] -
    5.048709793414476 * Power[10, -29] * y1)^(1/3) + 3.461218297729382 * Power[10, 6]
  (-8.523142260999616 * Power[10, -10] + 3.1550526047866546 * Power[10, -13] * x1 +
    √(4. (5.483566388684924 * Power[10, -7] - 1.2679755640099741 * Power[10, -10] * y1)^3 +
      (8.523142260999616 * Power[10, -10] - 3.1550526047866546 * Power[10, -13] * x1 +
        5.048709793414476 * Power[10, -29] * y1)^2) -
    5.048709793414476 * Power[10, -29] * y1)^(1/3) + (0.0006966690847162603 * y1) /
  (-8.523142260999616 * Power[10, -10] + 3.1550526047866546 * Power[10, -13] * x1 +
    √(4. (5.483566388684924 * Power[10, -7] - 1.2679755640099741 * Power[10, -10] * y1)^3 +
      (8.523142260999616 * Power[10, -10] - 3.1550526047866546 * Power[10, -13] * x1 +
        5.048709793414476 * Power[10, -29] * y1)^2) -
    5.048709793414476 * Power[10, -29] * y1)^(1/3)


H2[{x1_, y1_}] :=
  If[y1 ≥ F[x1], Sqrt[G[x, {x1, y1}]], -Sqrt[G[x, {x1, y1}]]] /. {x → Hulu[{x1, y1}]}

res = Map[H2[#] &, Take[tocke, 100]];
```

Histogram[res, HistogramCategories → 500]

Histogram[res, HistogramCategories → 300, HistogramRange → {-300, 700}]

```
f1 = CForm[2701.4263559564183` -
```

$$3.0128586744246784` \Big/ \Big(-8.523142260999616` *^-10 + 3.1550526047866546` *^-13\,x1 +$$

$$\sqrt{\Big(4.` \big(5.483566388684924` *^-7 - 1.2679755640099741` *^-10\,y1\big)^3 +}$$

$$\big(8.523142260999616` *^-10 - 3.1550526047866546` *^-13\,x1 +$$

$$5.048709793414476` *^-29\,y1\big)^2\Big) - 5.048709793414476` *^-29\,y1\Big)^{1/3} +$$

$$3.461218297729382` *^6 \Big(-8.523142260999616` *^-10 + 3.1550526047866546` *^-13\,x1 +$$

$$\sqrt{\Big(4.` \big(5.483566388684924` *^-7 - 1.2679755640099741` *^-10\,y1\big)^3 +}$$

$$\big(8.523142260999616` *^-10 - 3.1550526047866546` *^-13\,x1 +$$

$$5.048709793414476` *^-29\,y1\big)^2\Big) - 5.048709793414476` *^-29\,y1\Big)^{1/3} +$$

$$(0.0006966690847162603`\,y1) \Big/ \Big(-8.523142260999616` *^-10 + 3.1550526047866546` *^-13\,x1 +$$

$$\sqrt{\Big(4.` \big(5.483566388684924` *^-7 - 1.2679755640099741` *^-10\,y1\big)^3 +}$$

$$\big(8.523142260999616` *^-10 - 3.1550526047866546` *^-13\,x1 +$$

$$5.048709793414476` *^-29\,y1\big)^2\Big) - 5.048709793414476` *^-29\,y1\Big)^{1/3}\Big]$$

```
2701.4263559564183 - 3.0128586744246784/
   Power(-8.523142260999616e-10 +
     3.1550526047866546e-13*x1 +
     Sqrt(4.*Power(5.483566388684924e-7 -
         1.2679755640099741e-10*y1,3) +
      Power(8.523142260999616e-10 -
         3.1550526047866546e-13*x1 +
         5.048709793414476e-29*y1,2)) -
      5.048709793414476e-29*y1,0.3333333333333333) +
   3.461218297729382e6*Power(-8.523142260999616e-10 +
     3.1550526047866546e-13*x1 +
     Sqrt(4.*Power(5.483566388684924e-7 -
         1.2679755640099741e-10*y1,3) +
      Power(8.523142260999616e-10 -
         3.1550526047866546e-13*x1 +
         5.048709793414476e-29*y1,2)) -
      5.048709793414476e-29*y1,0.3333333333333333) +
   (0.0006966690847162603*y1)/
    Power(-8.523142260999616e-10 +
     3.1550526047866546e-13*x1 +
     Sqrt(4.*Power(5.483566388684924e-7 -
         1.2679755640099741e-10*y1,3) +
      Power(8.523142260999616e-10 -
         3.1550526047866546e-13*x1 +
         5.048709793414476e-29*y1,2)) -
      5.048709793414476e-29*y1,0.3333333333333333)
```

```
Export["~/Desktop/fun1.dat", f1]
```

~/Desktop/fun1.dat