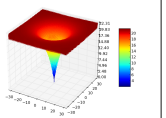
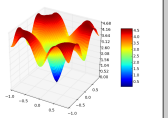
Ackley's Function

Two dimensional view	Fine grain view
	

Function

$$f(x_0 \cdots x_n) = -20exp(-0.2\sqrt{\frac{1}{n}\sum_{i=1}^{n} x_i^2}) - exp(\frac{1}{n}\sum_{i=1}^{n} cos(2\pi x_i)) + 20 + e$$

$$-32 \leq x_i \leq 32$$

$$\text{minimum at } f(0, \cdots, 0) = 0$$

Latex

A minimization problem:

```
$$f(x_0 \cdots x_n) = -20 exp(-0.2 \sqrt{\frac{1}{n} \sum_{i=1}^n x_i^2}) - exp(\frac{1}{n}
\sum_{i=1}^n cos(2\pi x_i)) + 20 + e$$

$$-32 \leq x_i \leq 32$$

$$\text{minimum at }f(0, \cdots, 0) = 0$$
```

Python

```
def fitnessFunc(self, chromosome):
        """"""
        firstSum = 0.0
        secondSum = 0.0
        for c in chromosome:
                firstSum += c**2.0
                secondSum += math.cos(2.0*math.pi*c)
        n = float(len(chromosome))
        return -20.0*math.exp(-0.2*math.sqrt(firstSum/n)) - math.exp(secondSum/n) + 20 + math.e
```

Sources

The following may or may not contain the originator of this function.

Ackley's function was first published in "A connectionist machine for genetic hillclimbing" by Ackley, D.H.. And was extended to arbitrary dimension in "Evolutionary algorithms in theory and practice: evolution strategies, evolutionary programming, genetic algorithms" by Back, T..

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www-optima.amp.i.kyoto-u.ac.jp

Real-Space Evolutionary Annealing

Evolutionary algorithms in theory and practice: evolution strategies, evolutionary programming, genetic algorithms

```
@book{back1996evolutionary,
  title={Evolutionary algorithms in theory and practice: evolution strategies, evolutionary programming, genetic algorithms},
  author={B{\"a}ck, T.},
  year={1996},
  publisher={Oxford University Press, USA}
}
```

Evolutionary Programming Made Faster

```
@ARTICLE{771163,
author={Xin Yao and Yong Liu and Guangming Lin},
journal={Evolutionary Computation, IEEE Transactions on}, title={Evolutionary programming made faster},
year={1999},
month={jul},
volume={3},
number={2},
pages={82 -102},
keywords={Cauchy mutation;combinatorial optimization problems;convergence rates;evolutionary programming;global optimum;local minima;multimodal functions;numerical optimization problems;primary search operator;search step size;unimodal functions;convergence;evolutionary computation;optimisation;probability;search problems;},
doi={10.1109/4235.771163},
ISSN={1089-778X},}
```

Test Suite for the Special Issue of Soft Computing on Scalability of Evolutionary Algorithms and other Metaheuristics for Large Scale Continuous Optimization Problems

```
@article{herrera2010test,
  title={Test suite for the special issue of soft computing on scalability of evolutionary algorithms and other metaheuristics for large scale continuous optimization problems},
  author={Herrera, F. and Lozano, M. and Molina, D.},
  journal={Last accessed: July},
  year={2010}
}
```

Empirical review of standard benchmark functions using evolutionary global optimization

```
@article{DBLP:journals/corr/abs-1207-4318,
  author    = {Johannes M. Dieterich and
               Bernd Hartke},
  title     = {Empirical review of standard benchmark functions using evolutionary
```

```
              global optimization},
  journal   = {CoRR},
  volume    = {abs/1207.4318},
  year      = {2012},
  ee        = {http://arxiv.org/abs/1207.4318},
  bibsource = {DBLP, http://dblp.uni-trier.de}
}
```

Notes