

**ГЕНЕТИЧЕСКИЕ АЛГОРИТМЫ
В БИОИНФОРМАТИКЕ**

1960-

[1].

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 , -
 , -
 , -
 . [2] -
 (-
), -
 . 1 -
 9 -
 61. -
 526 , -
 - 364 , . . . -
 $364/526 = 69,20 \%$. -

1.

-					-
	T	C	A	G	
T					T C A G
C					T C A G
A					T C A G
G			. - . - . - . -		T C A G

$f : C \rightarrow A,$
 $C \equiv \{a, c, g, t\}^3$ $A,$ 20
 $stop.$ $m : C \rightarrow C^9 -$,

$$Q(f^*) = 1 - \frac{1}{Q_m} \sum_{u \in C} \sum_{v \in m(u)} w(u, v) \rho(f^*(u), f^*(v)). \quad (1)$$

$f^* = f \circ h \quad h : A \rightarrow S,$ $S -$
 $\rho : S^2 \rightarrow [0, +\infty), \quad w(u, v) \geq 0 -$
 $u, v, Q_m -$, -
 $0 \leq Q(f^*) \leq 1.$, -
 h , -
 $P,$ 0 $1 -$ -
 $;$ $Hy,$ -
 $;$ $\alpha -$ (-
 $He [2].$) -

$|f^{*-1}(x)| = |(St \circ h)^{-1}(x)|;$, « -
 $\forall x \in S \quad |f^{*-1}(x)| > 0;$ » $\forall x \in S$ -
 $-$, -

$$\forall x \in S \quad \frac{||f^{*-1}(x)| - |(St \circ h)^{-1}(x)||}{|(St \circ h)^{-1}(x)|} \leq \theta,$$

θ $1/3$ (, -
 $2 \quad 4,$ -
 $27 \leq , \leq 34).$ -

$$\forall u \in C, x \in S \quad P\{f^*(u) = x\} = \frac{1}{64} |(St \circ h)^{-1}(x)|.$$

(1)

10^5

.2.

2.

	, %	
<i>P</i>		69,20
		$49,19 \pm 2,91$
		$50,21 \pm 3,10$
<i>Hy</i>		77,44
		$61,52 \pm 1,48$
		$61,77 \pm 2,07$
<i>He</i>		85,86
		$81,59 \pm 0,69$
		$81,65 \pm 1,97$

« »

20

$21^{64} (10^{80}), - 3^{64}$

(1)

1. N_0
 2. $T, F_t, t = 1, \dots, T$ 3–6.
 3. F_t
- $f_i \in F_t, N_c, F_t,$

4. F_t N_m
 $f_i \in F_t$.

5. ,

6. L ,

$$m(f)(u) = \begin{cases} f(u), & f_i \in F_t, \\ x_1, & x_1 \in S, x_1 \neq f(u), & (1-p), & pR(x_1, f(u)), \\ \vdots & \\ x_n, & x_n \in S, x_n \neq f(u), & pR(x_n, f(u)). \end{cases}$$

$$R(x, y) = \frac{|(St \circ h)^{-1}(x)|}{1 - |(St \circ h)^{-1}(y)|}$$

64 , p

$T = 50000$; $N_0 = 50$;
 $L = 250$; $N_c = 4$
 $N_m = 2$; $p = 0,1$.

3. 20 ;

α - Hy

4. (ijk) , (\overline{kji}) -

TA 78,29 % ; TC TG -

3.

	, %	
<i>P</i>		69,20
		77,86
		78,30
<i>Hy</i>		77,44
		80,05
		81,66
<i>He</i>	-	85,86
		89,26
		91,30

4.

-					-
	T	C	A	G	
T					T C A G
C					T C A G
A					T C A G
G			. - . - . - . -		T C A G

,
 ,
 ,
 . 4,
 C A, (.5),
 :
 T A, -
 C G. .4 , -
 - 77,86%.
 . 4
 « 90 », -
 .6 , -
 T C,
 - A G.

5. ,

-					-
	T	C	A	G	
T					T C A G
C					T C A G
A					T C A G
G		. - . - . - . -			T C A G

The standard genetic code is compared with randomly generated genetic codes and with the optimal codes obtained by genetic algorithm. In genetic algorithms, polarity tables are used as the "organisms" of a population based on three types of information, and, thus, the optimal variants of asymmetric codes are constructed, as well as the codes with approximately the same characteristics as a standard code.

A.M. Gupal, M.A. Gupal

THE GENETIC ALGORITHMS IN BIOINFORMATICS

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1. ... , 1968. 376 .
2. 2014. 5. . 17 – 24.
3. ... , 2016. 228 .

29.05.2019

Об авторах:

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