

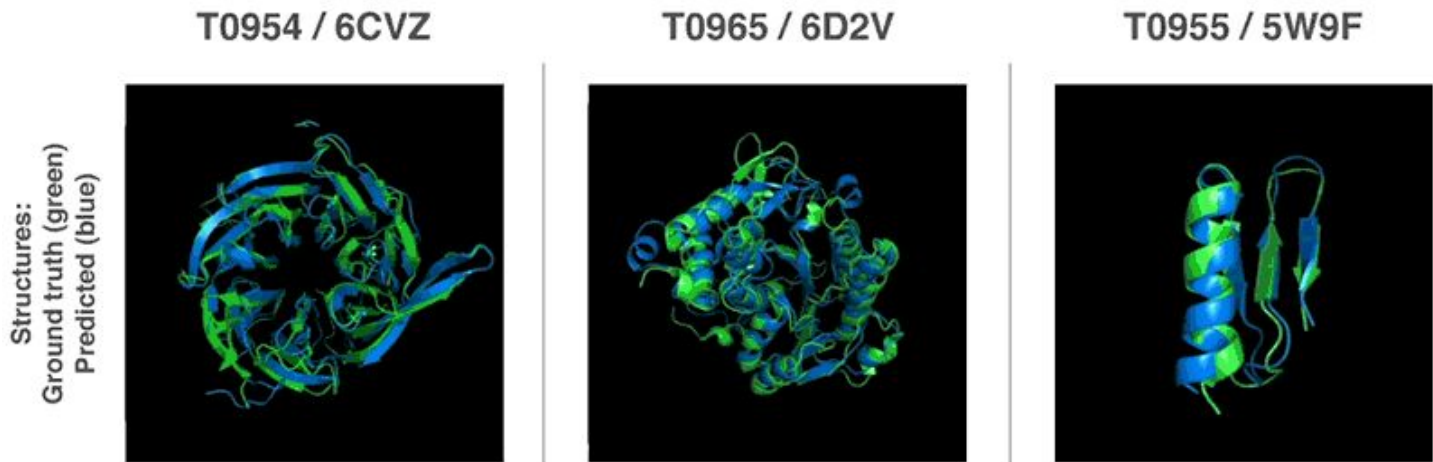
Learning To Design RNA

Презентацию подготовила:

Бочкарева Мария

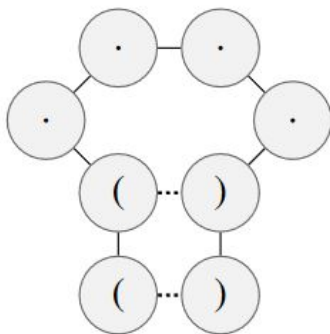
БПМИ151

Задача моделирования РНК



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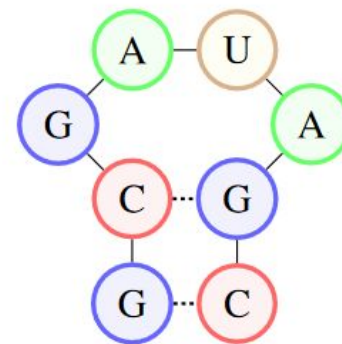
Definition 1 (RNA Design). Given a folding algorithm \mathcal{F} and a target RNA secondary structure ω , the RNA Design problem is to find an RNA sequence $\phi \in N^{|\omega|} = \{A, G, C, U\}^{|\omega|}$ that satisfies $\omega = \mathcal{F}(\phi)$.



(a) Target structure ω



(b) RNA sequence $\phi \in N^{|\omega|}$



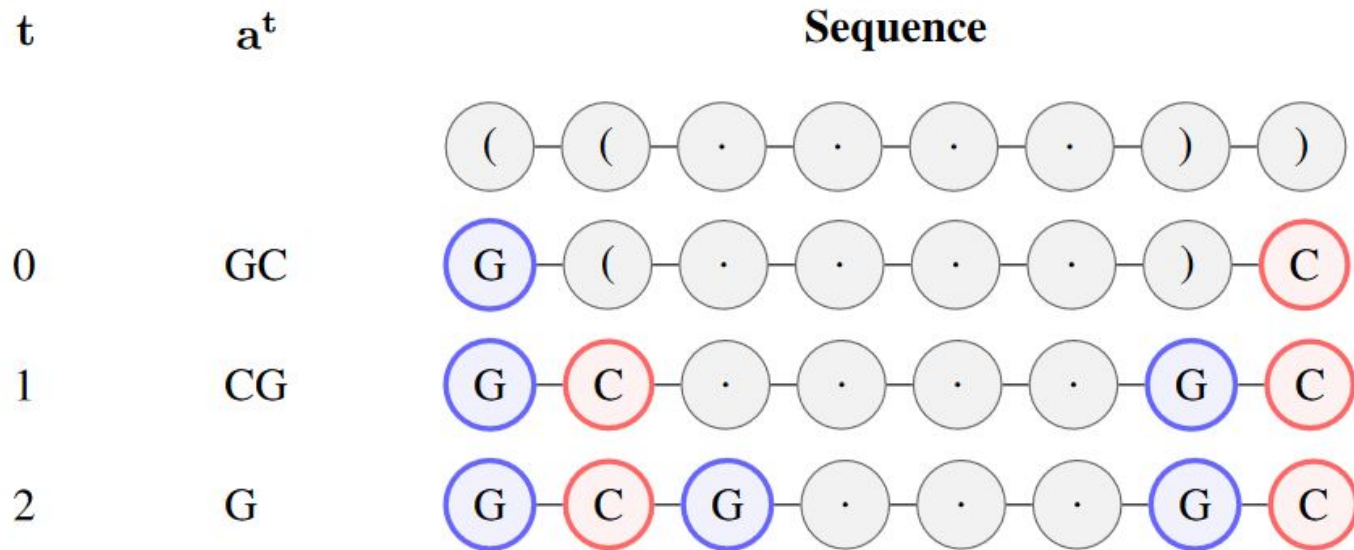
(c) Fold $\mathcal{F}(\phi)$

Пространства действий и состояний

$$\mathcal{A} := \{0, 1, 2, 3\} \equiv \begin{cases} \{A, G, C, U\} & \text{for } \mathcal{C}_\omega(t) = . \quad [\text{"dot"}] \\ \{GC, CG, AU, UA\} & \text{for } \mathcal{C}_\omega(t) = (\quad [\text{"opening bracket"}] \end{cases}$$

$$\mathcal{S} := \{0, 1, 2, 3\}^{2\kappa+1} \equiv (\mathcal{B} \cup \{\text{padding}\})^{2\kappa+1}$$

Пространство действий



Методы обучения и Reward

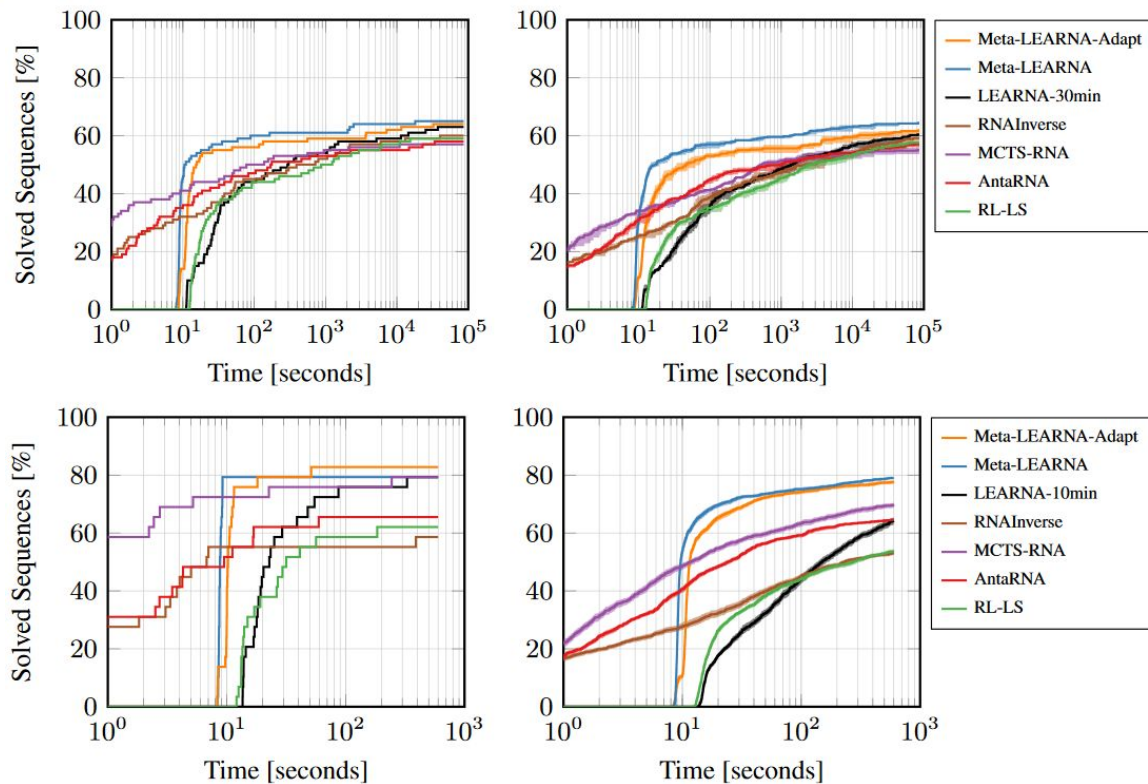
$$L_{\omega}(\mathcal{F}(\phi)) := \left(\frac{d_H(\mathcal{F}(\phi), \omega)}{|\omega|} \right)^{\alpha}$$

- LEARNA
- Meta-LEARNA
- Meta-LEARNA-Adapt

Результаты

METHOD	SOLVED SEQUENCES [%]		
	ETERNA100	RFAM-TANEDA	RFAM-LEARN-TEST
MCTS-RNA	57	79	97
ANTARNA	58	66	100
RL-LS	59	62	62
RNAINVERSE	60	59	95
LEARNA-10MIN	-	79	95
LEARNA-30MIN	63	-	97
META-LEARNA-ADAPT	64	83	98
META-LEARNA	65	79	100

Результаты



Список литературы

1. <https://arxiv.org/pdf/1812.11951.pdf>
2. <https://deepmind.com/blog/alphafold/>
3. <https://github.com/automl/learn>