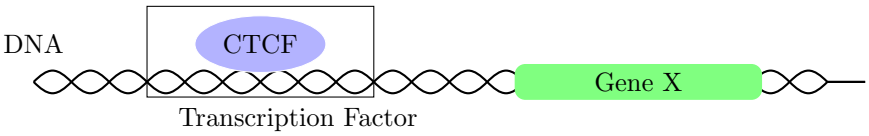
| Interval | Extended | Sorted |
|---|---|---|
| (0, 10, +) | (0, 24) | (0, 24) |
| (21, 31, -) | (7, 31) | (2, 26) |
| (7, 17, +) | (7, 31) | (3, 27) |
| (2, 12, +) | (2, 26) | (7, 31) |
| (17, 27, -) | (3, 27) | (7, 31) |
| (17, 27, +) | (17, 41) | (13, 37) |
| (33, 43, -) | (19, 43) | (17, 41) |
| (27, 37, -) | (13, 37) | (19, 43) |
| | $O(n)$ | $O(n \log n)$ |

| Index | Diff | Value | P-value | Peak |
|---|---|---|---|---|
| 0 | 1 | 1 | 0.93 | 0 |
| 2 | 1 | 2 | 0.81 | 0 |
| 3 | 1 | 3 | 0.63 | 0 |
| 7 | 2 | 5 | 0.27 | 0 |
| 13 | 1 | 6 | 0.15 | 0 |
| 17 | 1 | 7 | 0.08 | 0 |
| 19 | 1 | 8 | 0.03 | 1 |
| 24 | -1 | 7 | 0.08 | 0 |
| 26 | -1 | 6 | 0.15 | 0 |
| 27 | -1 | 5 | 0.27 | 0 |
| 31 | -2 | 3 | 0.63 | 0 |
| 37 | -1 | 2 | 0.81 | 0 |
| 41 | -1 | 1 | 0.93 | 0 |
| 43 | -1 | 0 | 0.99 | 0 |

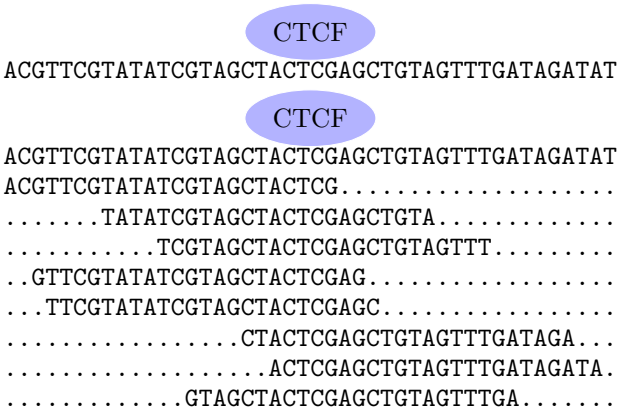
yielding the interval $[19, 24)$ as the only peak.

In a real experiment, more intervals would be yielded which would be affected by noise in the experiment. In order to reduce the effect of noise, two postprocessing steps are performed. First, small gaps between intervals are removed, then small peaks are removed:

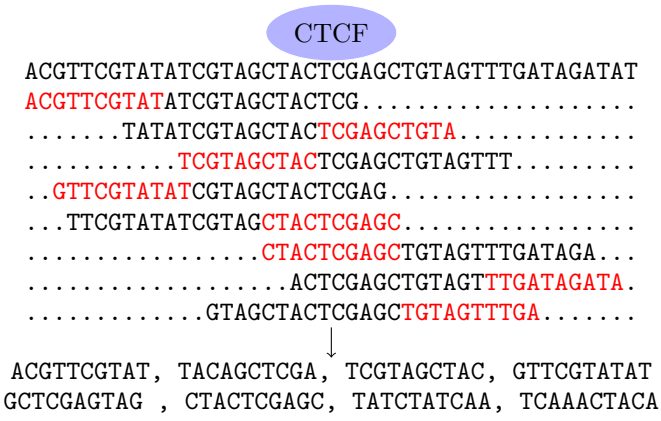
| Interval | Small Gaps Filled | Small Peaks Removed |
|---|---|---|
| (121, 125) | (121, 125) | |
| (142, 147) | (142, | (142, |
| (151, 166) | 166) | 166) |
| (172, 200) | (172, 200) | (172, 200) |



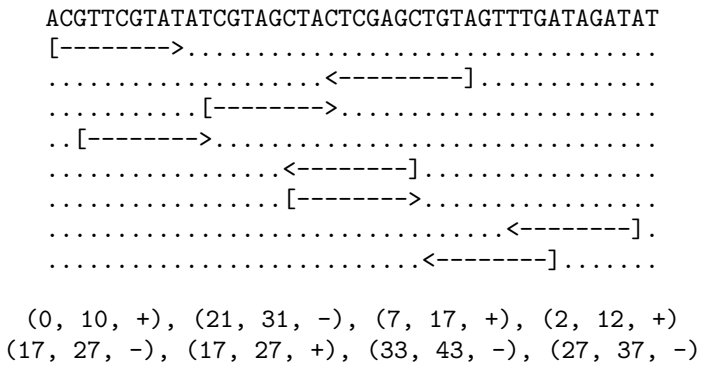

(a) Transcription factor binding to DNA, regulating the expression of Gene X




(b) DNA Fragments obtained form ChIP




(c) One end of each fragment is sequenced




(d) Sequenced reads mapped to the reference genome

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $ | A | C | G | T | T | A | C | G | G | T | A | C | C | G | T | A |
| A | $ | A | C | G | T | T | A | C | G | G | T | A | C | C | G | T |
| A | C | C | G | T | A | $ | A | C | G | T | T | A | C | G | G | T |
| A | C | G | G | T | A | C | C | G | T | A | $ | A | C | G | T | T |
| A | C | G | T | T | A | C | G | G | T | A | C | C | G | T | A | $ |
| C | C | G | T | A | $ | A | C | G | T | T | A | C | G | G | T | A |
| C | G | G | T | A | C | C | G | T | A | $ | A | C | G | T | T | A |
| C | G | T | A | $ | A | C | G | T | T | A | C | G | G | T | A | C |
| C | G | T | T | A | C | G | G | T | A | C | C | G | T | A | $ | A |
| G | G | T | A | C | C | G | T | A | $ | A | C | G | T | T | A | C |
| G | T | A | $ | A | C | G | T | T | A | C | G | G | T | A | C | C |
| G | T | A | C | C | G | T | A | $ | A | C | G | T | T | A | C | G |
| G | T | T | A | C | G | G | T | A | C | C | G | T | A | $ | A | C |
| T | A | $ | A | C | G | T | T | A | C | G | G | T | A | C | C | G |
| T | A | C | C | G | T | A | $ | A | C | G | T | T | A | C | G | G |
| T | A | C | G | G | T | A | C | C | G | T | A | $ | A | C | G | T |
| T | T | A | C | G | G | T | A | C | C | G | T | A | $ | A | C | G |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 16 | $ | A | C | G | T | T | A | C | G | G | T | A | C | C | G | T | A |
| 15 | A | $ | A | C | G | T | T | A | C | G | G | T | A | C | C | G | T |
| 10 | A | C | C | G | T | A | $ | A | C | G | T | T | A | C | G | G | T |
| 5 | A | C | G | G | T | A | C | C | G | T | A | $ | A | C | G | T | T |
| 0 | A | C | G | T | T | A | C | G | G | T | A | C | C | G | T | A | $ |
| 11 | C | C | G | T | A | $ | A | C | G | T | T | A | C | G | G | T | A |
| 6 | C | G | G | T | A | C | C | G | T | A | $ | A | C | G | T | T | A |
| 12 | C | G | T | A | $ | A | C | G | T | T | A | C | G | G | T | A | C |
| 1 | C | G | T | T | A | C | G | G | T | A | C | C | G | T | A | $ | A |
| 7 | G | G | T | A | C | C | G | T | A | $ | A | C | G | T | T | A | C |
| 13 | G | T | A | $ | A | C | G | T | T | A | C | G | G | T | A | C | C |
| 8 | G | T | A | C | C | G | T | A | $ | A | C | G | T | T | A | C | G |
| 2 | G | T | T | A | C | G | G | T | A | C | C | G | T | A | $ | A | C |
| 14 | T | A | $ | A | C | G | T | T | A | C | G | G | T | A | C | C | G |
| 9 | T | A | C | C | G | T | A | $ | A | C | G | T | T | A | C | G | G |
| 4 | T | A | C | G | G | T | A | C | C | G | T | A | $ | A | C | G | T |
| 3 | T | T | A | C | G | G | T | A | C | C | G | T | A | $ | A | C | G |